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# USSR Report

CHEMISTRY

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USSR REPORT  
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## ADSORPTION

### JOINT ADSORPTION ON STEEL OF STEARIC ACID AND ITS ESTERS FROM HYDROCARBON MEDIUM

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 47, No 3, May-Jun 85  
(manuscript received 28 Dec 83) pp 590-593

VOLNYANSKAYA, N. V. and KASYAN, O. S., Institute of Metallurgy,  
Dnepropetrovsk

[Abstract] Adsorption of Carbon-14 labelled stearic acid, glycol distearate, and glycerol tripalmitate surfactants from their solutions in mineral oil I-20 and hexadecane on carbon steel 08KP was studied. The steel was placed in contact with the acid and acid-ester solutions containing 0.1507 mol/dm<sup>3</sup> of each component for 1 min and 2 hrs at 80°C, then the adsorbed layers of surfactants were extracted from the steel with C<sub>6</sub>H<sub>6</sub> for 3 hrs at 70°C. The extracts were analyzed using a [undefined] radioactivity measuring method to determine the amounts of adsorbed surfactants. The adsorbed amounts were the greatest for the distearate and smallest for tripalmitate. The synergistic effect of increased adsorption of each surfactant adsorbed from a solution of the acid-distearate mixture was determined as compared to adsorption from the solutions of individual surfactants. No synergistic effect was determined in case of adsorption of surfactants from the acid-tripalmitate solution. These findings are important in relation to formation of boundary lubricant layer during machining of metals in the presence of cutting fluids. Figures 3; references 13: 13 Russian.  
[304-12928]

### ADSORPTION OF WATER-DISSOLVED SUBSTANCES BY MACROPOROUS POLYMER ADSORBENTS

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 47, No 3, May-Jun 85  
(manuscript received 29 Feb 83) pp 617-621

MAMCHENKO, A. V., YAKIMOVA, T. I. and MARTICH, V. Ye., Institute of Colloid Chemistry and Water Chemistry, UkrSSR Academy of Sciences, Kiev

[Abstract] Adsorption of p-chloroaniline, 2,5-dichlorophenol, 2,4-dibromo-phenol, Congo red, and brom cresol green from their aqueous solutions by macroporous copolymers of styrene and divinylbenzene was studied. Chloro-aniline, dichloro-phenol, and dibromo-phenol were adsorbed inside the copolymer particles. The red and green dyes were adsorbed on the surface of the

copolymer particles because the dye molecule size was larger than that of the copolymer particles. The copolymer particle size, determined using adsorption of known size dye molecules, was in agreement with that determined using electron microscopy. Figures 4; references 11: 1 Polish, 9 Russian, 1 Western.

[304-12928]

#### ADSORPTION EQUILIBRIUM OF DISSOLVED ORGANIC SUBSTANCES ON POLYSORBENTS

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 47, No 3, May-Jun 85  
(manuscript received 26 Dec 83) pp 621-623

PODLESNYUK, V. V., Institute of Colloid Chemistry and Water Chemistry, UkrSSR Academy of Sciences, Kiev

[Abstract] The structure and adsorption characteristics of the styrene-divinylbenzene copolymer polysorbent 40/100 were studied. Electron microscopy determined that the polysorbent had the primary porosity structure, that is, the porosity of spherical adsorbent particles, and the secondary porosity structure, that is, the porosity between the adsorbent particles. Based on adsorption of nitrobenzene, heptanol, benzene, hexanol, p-nitroaniline, amiline, p-nitrophenol, phenol and bromcresol green, bromthymol blue and Congo red dyes from their aqueous solution, it was determined that the average saturation adsorption pore volume of the polysorbent 40/100 was  $0.17 \text{ dm}^3/\text{mole}$  (+12%). Figures 2; references 15: 9 Russian, 6 Western.

[304-12928]

UDC 539.217.5;541.183.5

#### EFFECTS OF CARBON COATING ON INTERACTION OF HYDROGEN ATOMS AND MOLECULES WITH PALLADIUM SURFACE AND ON PERMEATION OF HYDROGEN THROUGH PALLADIUM MEMBRANES

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 8, Aug 85  
(manuscript received 22 Mar 84) pp 1112-1119

DOROSHIN, A. Yu., LIVSHITS, A. I. and SAMARTSEV, A. A., Leningrad Electrical Engineering Institute of Communication imeni Prof. M. A. Bonch-Bruyevich

[Abstract] Studies were conducted on the interaction and permeation of hydrogen atoms and molecules with carbon-coated and uncoated 20  $\mu\text{m}$ -thick palladium films, since such studies may contribute to a better understanding of heterogenous catalysis involving hydrogen. The data showed that carbonization of the palladium surface markedly decreases the rate of dissociative diffusion of hydrogen molecules and that, in distinction to noncoated surfaces, the rate constants show a strong dependence on the temperature of

palladium. As a result of passivation by carbon, the permeability of palladium membranes to hydrogen shows a pronounced drop at low hydrogen pressures. Concomitantly, the probability of diffusion of hydrogen atoms striking the surface remains high (ca.  $10^{-2}$ ) and is unaffected by the temperature of the metal. In view of this, the membranes show high selectivity for hydrogen atoms vis-a-vis hydrogen molecules. The putative mechanism proposed to account for this selectivity assumes that chemically active hydrogen atoms bind more strongly to the surface, and that their desorption into the gas phase is virtually an impossibility. Migrating on the surface, such atoms are more likely to encounter active sites and diffuse into the metal rather than encounter other hydrogen atoms and recombine to yield hydrogen molecules. Figures 3; references 29: 14 Russian, 15 Western.  
[2-12172]

AEROSOLS

UDC 621.928.97

EXPERIMENTAL INVESTIGATION OF DEPOSITION OF AEROSOLS IN FOAM APPARATUS

Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR:  
TEKHNICHESKIYE NAUKI in Russian Vol 10, No 2, Jun 85  
(manuscript received 30 Jan 84) pp 48-51

BURDUKOV, A. P., DOROKHOV, A. V. and NECHAYEV, P. G., SKB [Special Design Bureau?], Energokhimmash, Novosibirsk

[Abstract] Aerosols from transformer oil were captured in a foam apparatus consisting of a 57 mm glass cylinder 300 mm high with a gas-dispersing screen at the lower end. This screen had 3.5 mm perforations giving a total open area of either 2.3 or 5.2%; it was covered with a layer of water or of transformer oil. Aerosol particles had a median size of 4.4  $\mu\text{m}$  and a constant initial concentration of 2.82  $\text{g}/\text{m}^3$ . The percentage of particles passing through the apparatus dropped slightly with increasing flow rates for both water and oil foams. Increasing the particle size generally decreased the pass-through percentage. However, the largest size particles (8  $\mu\text{m}$ ) showed an increased pass-through percentage for the water foam, possibly because of a secondary expulsion of previously entrapped particles. Analysis of the data indicated that the "impact mechanism" plays the principle role in particle entrapment in the foam layer. A log-log graph of the pass-through percentage against Stoke's coefficient gave a straight-line dependence with the oil foam. The water foam however showed a region in which the secondary expulsion of particles had a substantial effect and the linear dependence failed to hold. Figures 4; references 4 (Russian).

[371-12672]

BIOCHEMISTRY

UDC 541.18.046+628.16

ISOLATION OF E. COLI BIOMASS FROM CULTURE FLUID BY CATIONIC FLOCCULENTS

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 13 Jul 83) pp 18-22

MEDVEDEV, Yu. V., LAZARENKO, Ye. N., BARAN, A. A. and TESLENKO, A. Ya.,  
All-Union Scientific Research Institute of Highly Purified Biopreparations,  
Leningrad; Institute of Colloid Chemistry and Water Chemistry  
imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Polyethyleneimine (PEI) and chitosan were tested for their effectiveness in the isolation of *E. coli* from culture fluid as part of a method for efficient recovery of bacterial cells in biotechnological processes. In the case of a synthetic medium, 92-95% of the cells were recovered by the addition of ca. 10 µg/10<sup>9</sup> cells of PEI or of ca. 30 µg/10<sup>9</sup> cells of chitosan in the pH interval of 4-9. In the case of washed *E. coli* cells suspended in NaCl or physiologic saline, equivalent degrees of recovery (95-98%) were obtained with much smaller concentrations of PEI or chitosan (ca. 1-5 µg/10<sup>9</sup> cells). The requirements for higher concentrations of the cationic polyelectrolytes in culture fluid studies were attributed to the interaction of the flocculents with medium components and the formation of complexes. Figures 7; references 9: 5 Russian, 4 Western.  
[338-12172]

CATALYSIS

UDC: 541.128

ACTIVITY OF DECATIONIZED AND CATIONIC TYPE Y ZEOLITES IN TRANSFORMATION OF  
1-OCTENE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA  
TEKHOLOGIYA in Russian Vol 28, No 7, 1985  
(manuscript received 11 Jul 83) pp 21-23

VOLF, V. Yu., ZHAVORONKOV, M. N. and DOROGOCHINSKIY, A. Z., Department of  
Petrochemical Synthesis, Groznensk Institute of Petroleum

[Abstract] Comparative data are presented on the joint influence of temperature and time on the activity of decationized and cationic type Y zeolites in the conversion of 1-octene, studied in a flow-through micro-reactor at 250-450°C with catalyst exposure time 3-120 minutes, carrier gas helium. Specimens were taken for analysis after 3, 10, 20, 70 and 120 minutes. Temperature and time maxima in the isomerizing activity were observed, resulting from the transformation of olefins on the acid heterogeneous catalysts by the mechanism: n-olefin C<sub>8</sub> yields iso-olefin C<sub>8</sub> yields hydrocarbons C<sub>2</sub>-C<sub>7</sub>, and results from competition between skeletal isomerization and splitting which occurs on a broad spectrum of acidic centers with the simultaneous decrease in the number and strength of such centers due to their deactivation by conversion products on the catalyst. The temperature maximum of the isomerizing activity shifts toward higher temperatures as catalyst operating time increases, resulting from the fact that the degree of deactivation of the stronger acid centers increases and splitting begins to occur on weaker zeolite centers. References 3:  
2 Russian, 1 Western.  
[368-6508]

LASER STIMULATION OF AMMONIA OXIDATION OVER HETEROGENOUS CATALYST<sup>E</sup>

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 8, Aug 85  
(manuscript received 25 May 84) pp 1030-1039

BELIKOV, A. P., BORMAN, V. D., NIKOLAYEV, B. I., SAZYKIN, A. A., TROYAN, V. I.  
and KHMELEV, A. V., Moscow Institute of Engineering and Physics

[Abstract] Comparative experimental studies were conducted on CO<sub>2</sub> laser-stimulated oxidation and decomposition of NH<sub>3</sub> over Pt and Cu oxide catalysts, employing conditions in which the NH<sub>3</sub> molecules were irradiated either in the gaseous phase over the catalyst, or when adsorbed on the catalyst surface. Analysis of the various factors demonstrated that irradiation of the gaseous phase resulted in resolution of the 66% <sup>15</sup>NH<sub>3</sub> mixture on the basis of selective excitation of <sup>14</sup>NH<sub>3</sub> and <sup>15</sup>NH<sub>3</sub>, as indicated by mass spectroscopic patterns. Furthermore, irradiation of the gaseous phase enhanced the rate of the reaction by ca. 10%, while a ca. 85% increase was obtained by irradiation of the catalyst surface. In the case of the copper oxide catalyst an exponential relationship prevailed between the rate and temperature, whereas with the platinum oxide catalyst the relationship was discontinuous. The former effects were ascribed to the conversion of CuO to the more active Cu<sub>2</sub>O form. In both cases, reaction enhancement by laser irradiation was ascribed to an increase in the concentration of active catalytic sites. Figures 5; references 30: 18 Russian, 12 Western.

[2-12172]

## CHEMICAL INDUSTRY

### CHEMICAL INDUSTRY PROBLEMS

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Aug 85 p 2

[Article by Ye. Leontyev, assistant editor for the section of Science and Technological Progress: "Fog at the Turn. Epilogue to the Meeting of the Chemical Industry"]

[Text] At the Joint Meeting of the Board of the Ministry of the Chemical Industry and the Presidium of the Central Committee of the Industry's Trade Union, the reports of Minister V. Listov and of many participants were, in general, full of self-criticism. It, probably, could not have been otherwise after the criticisms at the CPSU Central Committee Conference on the acceleration of the scientific and technological progress. It was said at the meeting that the Ministry of the Chemical Industry is, literally, overgrown with a multitude of various scientific institutions and experimental plants, but serious defects were still revealed in the development of new materials and technologies in this industry.

What are these materials and technologies? This was also discussed at the meeting. A true boom of small-tonnage chemistry, the production of pure and super-pure substances determining in many respects the level of modern technology is developing in the world. For example, additives to the drilling mud greatly increased the speed of well drilling. There are also some substances which lower the resistance of oil during its movement through pipelines. Inhibitors play a very important role: protecting metal against corrosion, they increase the reliability and service life of machines, equipment and structures. Chemists themselves need additives for polymers which improve their qualities and modern catalysts making it possible to increase the effectiveness of many technological processes without capital investments. The Ministry of the Chemical Industry has to solve these and other problems for the consumers.

According to the predictions of scientists, whoever will be able to develop membranes, will have the key to the technology of the 21st century. With their aid, many processes requiring now high temperatures and pressures can be accomplished at minimal expenditures of energy. Membranes are indispensable in medicine and the electronic, microbiological and food industries. However, many of their kinds have to be purchased abroad. The production scales of modern structural plastics are also far from satisfying the needs. For example, a ton of polycarbonate is capable of conserving as much as five tons of steel. However, there still is a shortage of this material.

It was stressed at the conference of the CPSU Central Committee that it is necessary to double or triple the efforts in order not to allow any lagging in the decisive directions. It could have been expected that the discussions at the enlarged board of the Ministry of the Chemical Industry would proceed in this direction. However, unfortunately, the acutest problems of the scientific and technological progress were only mentioned in the report of Minister V. Listov and they actually dissolved in a mass of other problems of the development of the industry.

It was probably in one respect that the report set the tone of the entire meeting: the speakers expressed many complaints against the industry's science. A number of scientific research organizations were criticized for their low efficiency in research. For example, it was mentioned that, in the SKTB [special technological design bureau] of catalysts, in the NII [Scientific Research Institute] of Chemistry and Technology of Cotton Cellulose and in the NPO [Scientific Production Association] "Norplast", the return per one ruble of expenditures was one ninth of the average industry's return, amounting to only 0.5-0.8 ruble. The indexes of a number of other teams were not much better. It would seem that it is urgently necessary to thoroughly analyze the situation in the state of affairs in the industry's science. However, the report did not contain any detailed analysis. Criticism in the report often amounted to statements such as, for example, the one by the director of the "Soyuzkhimplast" VPO [All-Union Production Association], V. Antipin:

"Scientists can be made to go to work at a plant only under strong pressure from above..."

Ye. Yegorova, chief chemist of the Leningrad "Plastpolimer" ONPO, commented that scientists' place is in laboratories and not at plants. If researchers are forced to work on what is needed today, the industry will have no future...

What is indicated by these diametrically opposite opinions? This industry has dozens of institutes and affiliated organizations with a whole army of scientists and specialists. Chemical research teams are widely represented in the system of the USSR Academy of Sciences, in republic academies and vuzes. It would be possible to obtain many promising ideas from them. However, the following fact seemed symptomatic to me: representatives of the academic science were not invited to the board where the ways of accelerating scientific and technological progress were discussed.

I shall add the following: intending to correct the situation, it is necessary to stress the right things. When scientists are accused that their work is not introduced into industry, such criticisms often do not apply. The implementation of important innovations, as a rule, requires capital investments, development of new equipment and construction or reconstruction of plants. These problems are handled by VPO and the ministry. However, there is a position for which scientists are fully responsible. It is the technical level of their research. What is the situation with this?

However paradoxical it is, the board gave practically no attention to this important problem. On the other hand, this question was answered last year by a commission created by GKNT [State Committee of the USSR Council of Ministers on

Science and Technology]. Having thoroughly studied the activities of fourteen leading scientific institutions of the Ministry of the Chemical Industry, it came to the conclusion that the part of their researches making it possible to exceed the world level was extremely low in them.

For example, in "Plastmassy" NPO, such research jobs constituted 3.6%, in "Karbonat" NPO -- 2.7%, in NVII [All-Union Scientific Research Institute] of Synthetic Fibers -- 1.5%, in "Khimvolokno" NPO -- 0.18% and in "Plastik" NPO -- only 0.15%. VNIIK did not have any outstanding research projects. Many research projects conclude with results which are lower than the world and the country's level.

The conclusions of the commission had no effect.

For what reason is the industry's science not up to the mark?

V. Rostunov stated at the meeting of the board that the management of science in this sector does not correspond to the modern requirements.

It was strange to hear these words from the chief of the administration on science and technology. However, as it turned out, he said that intentionally. The administration had only one institute under its direct control: Physical Chemistry Institute imeni L. Ya. Karpov. The rest of the institutes are distributed to VPO and the administration provides only scientific and methodological advice to them. This subordination system had to bring sectorial science closer to the needs of production. However, VOP administrators interpreted their rights in their own way.

For example, "Soyuztekgaz" VPO, has ten scientific research and planning and design organizations for nine specialized enterprises. However, as it became clear at the board meeting, most of them work not for the industry and not even for a subindustry, but play the role of emergency teams liquidating "weak points" at enterprises. VPO use scientists just as widely as additional help in their offices, allowing institutes to create numerous NOT [scientific organization of labor], economics and information departments.

As a result of this, there occurred a dangerous rearrangement of duties in the industry which was mentioned by Ye. Yegorova, chief chemist of "Plastpolimer". Plant laboratories, which used to play the role of representatives of everything new in chemistry, actually dissolved in other services of enterprises and concerns about the fulfillment of the plant. Their functions were transferred to sectorial NII [scientific research institutes] which became overloaded with minor current problems of production and weakened their research in promising directions guaranteeing the progress of the industry.

I. Besfamilnyy, assistant director of the administration on science and technology, complained that when they ask members of institutes to engage in research, some of them give a puzzled look and say that they have to help the plant to fulfill the plan.

I heard the same from other workers of the administration. They said that they did not have much influence on VPO and their institutes. The phrase "their institutes" indicated that they were trying to decline the responsibility for the results of the activities of the industry's science.

Let us assume that the administration on science and technology cannot influence the contents of the plans of all NII, KB [design bureaus] and NPO or the progress of the work on all numerous topics. However, it is a direct responsibility of the workers of the administration to control at least the main directions, react to the final results, raise questions to the administration of the ministry when there are the slightest symptoms of lagging and to improve the networks and structures of scientific institutions. However, they preferred to ignore these responsibilities.

V. Listov mentioned in his report that they repeatedly criticized the management of the administration for their poor control over the activities of the institutes. However, unfortunately, their criticisms had no effect...

What was done by the administration of the Ministry of Chemical Industry in this situation? This question was answered in the minister's report:

"We had to replace the curators, my deputies. Now, First Deputy Minister L. Osipenko is responsible for the administration on science and technology. However, the situation did not change."

I do not think that the administrators of the industry were unable to "cope with" their administration. It is more likely that this confession indicates that the problems of the acceleration of the scientific and technological progress were far from being first and foremost in the Ministry of the Chemical Industry. This is confirmed by the pace of the implementation of scientific achievements. To date, only 400 out of 1200 projects completed by the beginning of this five-year plan have been used. The remaining 800 are still awaiting their time. References to the absence of appropriations can hardly be accepted without reservation. For example, it was established by the GKNT commission that during the three years of the five-year plan, the Ministry of the Chemical Industry used less than two thirds of the funds allotted for the creation of experimental and experimental-industrial units.

Now, the workers of the ministry admit that the plans of scientific research and development have not been coordinated with the plans for the designing, capital construction and reconstruction of enterprises. As a result of this, quite often, the work was done more or less successfully until the production of experimental batches, but then it would remain unfinished. In essence, this means that the industry's science did not have reference points to which it had to bring the production.

The board instructed First Deputy Ministry L. Osipenko to coordinate the plans within a month. The question arises: if it can be done in such a short time, why was it not done earlier? Is it not because the headquarters of the industry was guided by a sluggish pace of technological progress in their plans for the next five-year plan? Now, after the criticisms at the conference in the CPSU Central Committee, it became necessary to urgently reconsider the plans and the strategy. This turned out to be quite complicated.

The minister kept asking for business-like proposals when the speakers tried to get off with general phrases of the type "it is time to think about it", "fundamental rearrangement is necessary", "serious changes are needed...".

Proposals, of course, were made. However, many of them seemed hasty and it was felt that not everyone was ready to reevaluate his work and the situation in the industry. Some of them were frankly afraid of the approaching changes. For example, R. Ivchenko, director of "Orgsteklo" Association, was in support of preserving VPO, saying that they are more accessible than the administration of the ministry. Evidently, he is not used to act independently.

Many of the speakers, supported, as a last resort, the proposal for creating new scientific-production associations. There is no argument against the idea itself. However, how will it be realized? What NPO have to be created? On what basis? With what tasks and fulfillment deadlines? These questions were not answered by the board. These questions have to be answered, since there are a few scientific-production associations among the groups where the research and development level is extremely low. This means that, when forming new NPO, it is necessary, first of all, to create conditions for their successful work and to clearly define their final goals.

In this connection, the report of the general director of the NPO "NIOPIK" [Scientific Research Institute of Organic Semi-Products and Dyes], V. Titov, is of interest. He revealed many causes of failures in the area of the small-tonnage chemistry. He said:

"In order to develop and put into production new substances and materials in proper time, the entire organization of work must be mobile. However, we continue to live by the norms of the "big" chemistry. We have the same deadlines for designing and creation of new plants, the same evaluation of our activities 'by the gross output' and the same method of incentives. As a result of this, the most valuable products turned out to be unprofitable to the enterprises because they are produced in small quantities. It is clear that they do not want to produce them."

This suggested the idea that, perhaps, series production of small-tonnage products should be entrusted to NPO. However, there were such proposals before. Together with other proposals, NIOPIK sent them to the ministry and GKNT. They were already examined by the committee, but the workers of the ministry still have not found time to react to them.

The meeting of the enlarged board of the Ministry of the Chemical Industry was intended to become a turning point in the development of this industry, but will there be actually drastic changes? So far, it is only possible to say that many points of the resolution adopted at the meeting of the board are in the nature of assignments, and the abundance of programs and measures that have to be examined indicate that the headquarters of the industry has not clearly defined the main directions of the acceleration of the scientific and technological progress.

10233  
CSO: 1841/347

UDC: 547.451.5

NEW METHOD OF PRODUCING 1,3,5-TRIACETYLBENZENE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHNOLOGIYA in Russian Vol 28, No 7, 1985 (manuscript received 8 Jan 84) pp 112-113

MIKHAYLOVSKIY, D. I. and MIKHAYLOVSKAYA, V. N., Department of Chemistry, Gorkiy Higher Military School of the Rear imeni I. Kh. Bagramyan

[Abstract] Continuing their studies seeking new synthetic methods for producing acetylene oxyketones, potential biologically active substances, the authors undertook this synthesis using butine-1-OH-3, absolute ethanol and orthoformic ether as initial substances in the presence of a small quantity of concentrated hydrochloric acid. The product of the reaction was 1,3,5-triacetylbenzene, used in the production of various polymers, pharmaceuticals and pesticides, in photography, as a vulcanizer, anticorrosion agent and in the production of dyes. References 11: 6 Russian, 5 Western. [368-6508]

UDC 547.256.2

SYNTHESIS OF DIISOBUTYL ALUMINUM HYDRIDE BY THERMOLYSIS OF TRIISOBUTYLALUMINUM UNDER ATMOSPHERIC PRESSURE

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 33-34

KORNEYEV, N. N., SHEVCHENKO, I. V., BEZUKH, Ye. P. and GOVOROV, N. N.

[Abstract] Since diisobutyl aluminum hydride (DIBAL-H) is a more efficient synthetic rubber catalyst than triisobutylaluminum (TIBAL), an efficient process has been designed for the conversion of TIBAL into DIBAL-H under atmospheric pressure. The optimal reaction scheme consists of thermolysis of TIBAL at 100°C for 5 h under a flow of inert gas (0.5-0.6 m<sup>3</sup>/kg TIBAL/h), resulting in the formation of DIBAL-H and isobutylene. Isobutylene is removed by refrigerated condensation, resulting in DIBAL-H yields of ca. 90%. Figures 1; references 4 (Russian). [3-12172]

ELECTROCHEMISTRY

UDC: 547.781.785:542.958.1

POTENTIOMETRIC STUDY OF OXIDATION OF BENZIMIDAZOLE TO IMIDAZOL-4,5-DICARBOXYLIC ACID BY SODIUM BICHROMATE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHNOLOGIYA in Russian Vol 28, No 7, 1985 (manuscript received 13 Oct 83) pp 41-44

ZERNOV, A. G., (deceased) and KOZOREZ, L. A., Department of General Chemistry and Chemical Technology, Rubezhnoye Branch, Voroshilovgrad Machine Building Institute

[Abstract] Imidazol-4,5-dicarboxylic acid is an intermediate in the synthesis of pharmaceuticals, plastics and dyes. The known method of its production by oxidation of benzimidazole with chromium compounds and ozone-containing gas or xidation of benzimidazole with potassium or sodium bichromate in sulfuric acid has a low yield of end product (50-52%). A potentiometric study of the oxidation of benzimidazole to imidazol-4,5-dicarboxylic acid by sodium bichromate in sulfuric acid was studied in order to find optimal conditions for the process. The stability of the end product was studied to determine the reason for the poor yield. Occurrence of a parallel reaction of breakdown of the end product was discovered, indicating that the prospects for achievement of high yield by this method are poor. Figures 3; references 4 (Russian).  
[368-6508]

## FERTILIZERS

### PROGRESS IN CONSTRUCTION OF FERTILIZER PLANTS

Kiev PRAVDA UKRAINY in Russian 12 May 85 p 2

[Article by I. Danilin: "At Fertility Projects"]

[Text] Successful solution of big and complex problems of increasing the production of agricultural products depends on further strengthening of the material and technical base of agriculture and, particularly, on the development of the use of chemicals in it. In accordance with the plans of the Eleventh Five-Year Plan, 26.5 million tons of mineral fertilizers will be supplied to the country's agriculture, and the output of mineral fertilizers will increase to 30-32 million tons by 1990 (in terms of 100% content of nutrient substances). This task is being successfully fulfilled. In 1981-1984, the enterprises of the Ukrainian SSR alone produced 600,000 tons more mineral fertilizers than was planned for this period in the five-year plan. This year, the level of their production will increase almost by one third in comparison with 1980.

This growth is achieved largely due to the orientation of the enterprises toward the production of highly concentrated and complex fertilizers, complex liquid mineral fertilizers, as well as fertilizers in the granular and large-crystal forms. This is facilitated by the reconstruction of the operating capacities and successful construction of new main complexes included in the plan.

In the last four years, the organizations of the Ministry of Industrial Construction, Ministry of Construction of Heavy Industry Enterprises and Ministry of Installation and Special Construction Work of the Ukrainian SSR, jointly with the client enterprises completed more than 765 million ruble worth of construction and installation jobs at the republic enterprises of the Ministry of Fertilizers. Capacities for the production of fertilizers and raw materials, such as ammonia and natural sulfur, warehouses and a number of other facilities started operating. This year alone, the workers of the republic pledged to complete ahead of schedule complexes for the production of carbamide at the Odessa Port Plant and at the Dneprodzerzhinsk Association "Azot" as well as facilities for the production of sulfur at the Nemirov mine of the Yavorov Association "Sera". The construction organizations working on these projects ensured the completion of the planned tasks during the first quarter.

These successes were possible through the high engineering preparation of the construction work and selfless work of the builders. For example, the "Yavor-khimstroy" Trust completed 112% of the plan for the first quarter for the

sulfur production complex. An outstanding complex team headed by V. I. Gavrikh is working at that construction site by the team contract method. This small team pledged to work two days a year using conserved material resources. The conservation fund is being constantly replenished. The result of the first quarter indicated that labor productivity increased by 4.3% and the cost of construction and installation jobs decreased by 0.8%.

The planned tasks are also overfulfilled in the construction of the carbamide complex at the Odessa Port Plant. Here, the teams of the trust "Odespromstroy" headed by V. I. Bespalko, P. S. Islamov, N. I. Kryzhanovskiy and others distinguished themselves. Jointly with the teams from the trust "Chernomorpromsantekhmontazh" and the trust "Krivorozhstal'konstruktsiya", they are using the block methods in erecting buildings and metal structures with the use of semi-automatic welding, which makes it possible for the teams to work at least two days using conserved material resources. During the first quarter, the plan of contracted jobs was fulfilled at the rate of 103%. At the present time, they completed the erection of the framework of the buildings and the concreting of the shaft of the granulation tower. The installation of large-size equipment is continuing.

The work of the builders from the trust "Dneprokhimstroy" of the Ministry of Construction of Heavy Industry Enterprises of the Ukrainian SSR is also progressing quite well. They are building a carbamide complex at the Dneprodzerzhinsk "Azot" Association. Good labor organization contributed to their success. The builders completed the concreting of the shafts of the granulation and elevator towers, started the installation of the framework of the synthesis unit and metal structures of flooring, and are completing the erection of the frameworks of the buildings.

However, the situation at some construction projects is not very good. At some construction projects, proper engineering preparation was not done and the necessary number of workers was not provided. There are indications that machines and devices stand idle. Moreover, client enterprises do not always provide sites to the contractor for construction on time and there are delays in solving the problems of timely deliveries of equipment, particularly nonstandard. As a result of this the plan for contracted jobs on the projects of the Ministry of Fertilizers was not fulfilled during the first quarter by the Ministry of Industrial Construction, Ministry of Construction of Heavy Industry Enterprises and Ministry of Installation and Special Construction Work. In the construction and installation jobs, 26% less funds were used than during the same period last year.

The most alarming situation has formed with the construction of a nitro-ammonophoska complex in the Rozdol Association "Sera". The "Rozdolkhimstroy" Trust completed only 88% of the plan for contracted jobs. They did not do their best, did not provide sufficient amounts of precast concrete, metal structures and pipes, and the client is not fully solving the problems of the deliveries of individual materials.

This year is the last year of the five-year plan. Therefore, it is particularly important to complete the planned complexes for the production of mineral fertilizers on time. It is necessary to ensure the increase in the output of

mineral fertilizers during the first years of the Twelfth Five-Year Plan. It is the responsibility of the builders to overcome the lagging, make up for what was lost and achieve tangible final results.

10233  
CSO: 1841/347

## RESIN PROTECTION OF CARBAMIDE GRANULES IN TRANSPORT

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Aug 85 p 2

[Article by N. Chulikhin, Togliatti: "Granules Do Not Age"]

[Text] Carbamide with the trademark of the "Tolyattiazot" Association is delivered to all parts of the country. There is a great demand for the valuable nitrogen fertilizer, an effective additive to animal food and the raw material for the chemical industry. However, the problem is that carbamide granules become caked during their transportation in railroad cars and lose their properties.

Chemists prevent this undesirable effect by treating mineral fertilizers with a special formaldehyde resin. Until recently, "Tolyattiazot" received it from Gorlovka irregularly. It was expensive and troublesome. However, now, it is no longer necessary to bring it in: the state commission accepted a unit for producing such resin here. Its capacity will make it possible for the enterprise not only to satisfy their technological needs, but also to set up the production of varnishes and dyes, glues, film coatings and other household chemistry products.

10233  
CSO: 1841/347

FREE RADICALS

UDC 541.127+543.42+623.384.8

STUDIES ON HO<sub>2</sub> RADICAL REACTIONS WITH COMBINED EPR/LMR SPECTROMETER.  
MEASUREMENTS OF ABSOLUTE HO<sub>2</sub> RADICAL CONCENTRATIONS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 8, Aug 85  
(manuscript received 3 Jul 84) pp 1091-1095

ROZENSHTEYN, V. B., GERSHENZON, Yu. M., ILIN, S. D. and KISHKOVICH, O. P.,  
Institute of Chemical Physics, USSR Academy of Sciences, Moscow

[Abstract] Technical details are presented on the generation of HO<sub>2</sub> radicals, and the use of a combined EPR/LMR (electron paramagnetic resonance/laser magnetic resonance) spectrometer for the determination of the absolute HO<sub>2</sub> concentration with a fast-flow system. The experiments were conducted under pressures of 1 to 25 torr at room temperature. The sensitivity of the spectrometer for HO<sub>2</sub> was determined to be ca. (1-3) x 10<sup>10</sup> cm<sup>-3</sup> at pressures of 10 torr or less, decreasing three- to five-fold at 25 torr as a result of spectral spread. Data are also presented on the prevailing sensitivities in recording other paramagnetic particles.

Figures 2; references 26: 7 Russian, 19 Western.

[2-12172]

UDC 541.124+541.127

REACTIVITY OF TERTIARY PEROXYL RADICALS IN LIQUID PHASE: KINETICS OF  
REACTION OF TERTIARY BUTYL PEROXYL RADICAL WITH STERICALLY FAVORABLE PHENOLS

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 8, Aug 85  
(manuscript received 2 Feb 84) pp 1107-1111

MARDOYAN, V. A., TAVADYAN, L. A. and NALBANDYAN, A. B., Institute of  
Chemical Physics, Armenian SSR Academy of Sciences, Yerevan

[Abstract] EPR spectroscopy was employed in experimental studies on the reaction of tertiary butyl peroxy radical with sterically favorable phenols in the temperature range of -64 to -10°C. The rate of reaction of the RO<sub>2</sub> radicals with the phenols under study was proportional to the concentration of the reactants and satisfactorily described by a second order

equation. The rate constants at -64°C ranged from 1.29 liters/mole·sec for the m-NO<sub>2</sub> substituent phenol, to 3.92 liters/mole·sec for the p-CH<sub>3</sub>O derivative. The energies of activation ranged from 1.5 kcal/mole (p-CH<sub>3</sub>O derivative) to 4.03 kcal/mole (p-Cl derivative). The relatively low values for the energies of activation were ascribed to the polar nature of the transition complexes, involving a partial charge transfer in the transition state from the oxygen atom of phenol to the attacking radical. The Hammett equation was found to provide a satisfactory description of the relationship between the logarithm of the rate constant and the  $\sigma^+$  constant of the substituent group on phenol. Figures 3; references 10: 7 Russian, 3 Western.

[2-12172]

INORGANIC COMPOUNDS

UDC 577.113.6:542.95

AUTOMATED SYNTHESIS OF OLIGODESOXYRIBONUCLEOTIDES. Part 1. STUDY OF SUBSTRATES BASED ON SILICA GEL 'SILOKHROM'

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 11, No 7, Jul 85  
(manuscript received 23 Oct 84; in revised form 22 Mar 85) pp 920-926

LOMAKIN, A. I., YASTREBOV, S. I. and POPOV, S. G., All-Union Scientific Research Institute of Molecular Biology, Koltsovo, Novosibirsk Oblast

[Abstract] Three grades of silica gel ("Silokhrom" S-40 MK, S-80, and S-120) were first treated with aminopropyltriethoxysilane to provide anchor amino groups. They were then treated with succinic anhydride and trimethylchlorosilane in the presence of dimethylaminopyridine. Finally, 5'-0-dimethoxytritylthymidine was attached with the help of N,N'dicyclohexylcarbodiimide. The quantities of introduced nucleosides were 38, 42 and 59 micromoles/g substrate respectively, compared to 29 micromoles/g for a porous glass control sample. Using these substrates, nucleotide chains were built up in an automated reactor "Viktoriya-2." Comparative yields for the various silica gel substrates and the porous glass are given. The dekadesoxyribonucleotide dACTGTCCGCT was synthesized on the S-80 substrate with a 4.3% yield, following a cyclical scheme of washing, unblocking and nucleotide addition. First-stage yields could also be increased by treating the substrates with 5'-0-dimethoxytritylthymidine-3'-0-succinate and triisopropylbenzenesulfonylchloride and methylimidazole. Figures 3; references 16: 4 Russian, 12 Western.  
[357-12672]

## ION-EXCHANGE PHENOMENA

### CONFERENCE ON CHROMATOGRAPHY

Frunze SOVETSKAYA KIRGIZIYA in Russian 11 Jun 85, p 1

[Article by Kirgiz Telegraph Agency (KIRTAG) reporter: "Road to Wasteless Technology"]

[Text] Problems of using ion-exchange materials in the national economy were discussed at a meeting of specialists on chromatography at the Kirgiz SSR Academy of Sciences. The participants included representatives of scientific institutions, vuzes and industrial enterprises of Moscow, Kiev, Yerevan, Voronezh, Sverdlovsk and other cities of the country. They told about their research in this promising direction and exchanged their views.

Definite successes in obtaining ion-exchange materials and using them in the national economy were achieved by the scientists of the Institute of Organic Chemistry and the Institute of Inorganic and Physical Chemistry of the Kirgiz SSR Academy of Sciences. For example, jointly with the specialists of the Kara-Balta Alcohol Plant, they developed and introduced a unit for extracting betaine and glutaminic acid, valuable medicinal preparations, from molasses. Chemical scientists are closely cooperating with the Frunze Antibiotic Plant, where ion-exchange resins are used widely for separating amino acids from products of microbiological synthesis. Ion-exchange technology is used for producing ultra-pure metals at the Kadamzhayskiy Antimony Combine.

10233  
CSO: 1841/347

STUDY OF HYDRATION OF HOMOGENEOUS ION-EXCHANGE MEMBRANES MK-100, MA-100,  
AND MF-4SK

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 47, No 3, May-Jun 85  
(manuscript received 28 Nov 83) pp 594-597

GREBENYUK, V. D., BUDRIKH, T. D., MAKARENKO, T. I. and MANK, V. V.,  
Institute of Colloid Chemistry and Water Chemistry, UkrSSR Academy of  
Sciences, Kiev

[Abstract] The moisture content of the homogeneous cation-exchange membranes MK-100 and MF-4SK in the H, Li, Na, NH<sub>4</sub>, K, Cs, Mg, Ca, Sr, and Ba forms and the homogeneous anion-exchange membrane MA-100 in the OH, F, Cl, Br, I, HCO<sub>3</sub>, SO<sub>4</sub>, and CO<sub>3</sub> forms were determined using nuclear magnetic resonance. The moisture content decreased in the following order: MK-100, MF-4SK, and MA-100. The moisture content of the membranes, depending on their form, decreased as follows:

MK-100      H>Li>Na>NH<sub>4</sub>>K>Cs>Mg>Ca>Sr>Ba

MF-4SK      H>Li>Na>K>NH<sub>4</sub>>Cs>Mg>Ca>Sr>Ba

MA-100      F>CO<sub>3</sub>>OH>SO<sub>4</sub>>HCO<sub>3</sub>>Cl>Br>I

The moisture content of the MK-100 membrane was comparable to that of cation-exchange resin KU-2 and anion-exchange resin AV-17. The hydration number of that membrane, depending on its form, was greater than that of the KU-2 sulfocationite resin by a factor of 1-3.7. Figures 4; references 16 (Russian).

[304-12928]

NITROGEN COMPOUNDS

UDC 548.7373

X-RAY STRUCTURAL ANALYSIS OF COMPLEX-FORMING ORGANIC LIGANDS. PART 8.  
CRYSTALLINE AND MOLECULAR STRUCTURE OF NITRYL TRIPROPIONATE

Novosibirsk ZHURNAL STRUKTURNOY KHMII in Russian Vol 26, No 3, May-Jun 85  
(manuscript received 20 Jul 83) pp 153-157

GASPARYAN, A. V., SHKOLNIKOVA, L. M., TSIRULNIKOVA, N. V., YEGORUSHKINA, N. A.,  
MAKAREVICH, L. G. and DYATLOVA, N. M., All-Union Scientific Research  
Institute of Chemical Reagents and Highly Purified Chemicals

[Abstract] X-ray structural analysis was conducted on the monoamine complexing agent nitryl tripropionate to further define its potential as a tetradentate ligand. The resultant data on atomic coordinates, bond lengths, valence angles and hydrogen bond geometries are summarized in tabular form, and graph presentations are given of molecular conformation and structural projections. Nitryl tripropionate is a zwitter ion as a result of deprotonation of one of the propionate groups and protonation of the N atom, and the C-N bonds are elongated by 0.03-0.04 Å in comparison with the sum of covalent radii. The presence of intramolecular H bonds leads to the formation of two six-membered alanine H-rings, with an angle of 71.4° between their planes. This represents the first report of such structures in complexing agents. The presence of intermolecular H bonds accounts for the formation of dimers. Figures 2; references 18: 5 Russian, 13 Western.  
[369-12172]

ORGANOMETALLIC COMPOUNDS

UDC 541.126-16

TWO-STAGEDNESS OF THERMAL DECOMPOSITION OF COPPER GLYCINATE

Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR: SERIYA  
Khimicheskiye nauki in Russian Vol 11, No 4, Jul 85 pp 86-93

SHELKOVNIKOV, V. V. and YEROSHKIN, V. I., Novosibirsk Institute of Organic Chemistry

[Abstract] An experimental study of copper complexes with amino acids and of their thermal decomposition was made, specifically of copper glycinate at temperatures of  $245\text{--}30^\circ\text{C}$  under vacuum with the residual pressure not exceeding 0.67 Pa. A powder specimen of this compound was placed in a heating-and-weighing chamber with continuous removal of gaseous decomposition products. The residues of decomposition to various levels down to  $\sigma = 0.01$  were withdrawn from the retort and examined at room temperature: for x-ray diffraction with an URS-0.1 instrument, for infrared spectra with an UR-20 spectrophotometer, and for electron-paramagnetic-resonance spectra with a "Sibir" EPR-3 instrument. The  $\text{Cu}^+$ -ion concentration was measured by quantitative analysis on the basis of Cu(I) determination with phenanthroline. The gaseous decomposition products were analyzed with a Varian MAT 311 chromatograph-spectrometer. It has been established that thermal decomposition under vacuum, unlike in air, is an endothermal process. The curves of  $\text{CuGly}_2$  decomposition kinetics and the absorption spectra of the  $\text{Cu}^+-\text{Phen}$  complex at various levels of thermal decomposition as well as x-radiographic analysis and quantitative  $\text{Cu}^+$  analysis reveal a two-stage process with reduction of  $\text{Cu}^{2+}$  to  $\text{Cu}^+$  from the very beginning and at a rate which increases with time. In the first stage of thermal decomposition of copper glycinate under vacuum, the copper-ligand bond ruptures with formation of the carboxylamine radical  $\text{H}_2\text{N}-\text{CH}_2-\text{C}(=\text{O})-\text{O}^-$ , this rupture becoming irreversible and the radical becoming decarboxylized during the second stage.

Figures 7; references 15: 7 Russian, 1 Polish, 7 Western (6 in Russian translation).

[377-2415]

UDC 547.48:541.49.632

METAL-CONTAINING COMPLEXES OF LACTAMS, IMIDAZOLFS AND BENZIMIDAZOLES AND THEIR BIOLOGICAL ACTIVITY

Moscow USPEKHI KHIMII in Russian Vol 53, No 7, Jul 85 pp 1152-1174

KUKALENKO, S. S., BOVYKIN, B. A., SHESTAKOVA, S. I. and OMELCHENKO, A. M., All-Union Scientific Research Institute of Chemical Substances for Plant Protection, Moscow

[Abstract] Recent work on the synthesis, structure and biological activity of transition metal complexes of lactams, imidazoles and benzimidazoles is reviewed. Metal-lactam complexes are synthesized by heating, sometimes with the use of reagents such as 2,2-dimethoxypropane or lactam-O-sulfates. IR and NMR indicate that lactams are monodentate, coordinating via the carbonyl oxygen, except for complexes of 5-allyl-1-(beta-amino-ethyl)-2-pyrrolidone with platinum or palladium. Metal complexes with imidazoles or benzimidazoles are obtained by heating, fusion of azoles with metal halides or ligand exchange. Large substituents near the center of coordination reduce the coordination number. Coordination occurs mostly through the unsaturated ring nitrogen, with a die-chain heteroatom or the pi-system sometimes involved. In benzimidazoles, coordination via the ring NH has also been reported. Bidentate ligands, involving ring and side-chain, are known. The type of polyhedron formed depends on coordination number, electronic configuration, nature of the anion and ligand and system aggregate state. The stability of imidazole-metal complexes has been found to depend on nonaqueous solvent properties and substituent inductive effects. Many metal complexes with lactams, imidazoles and benzimidazoles possess biological activity. Examples include anticancer and antimicrobial drugs, vasodilators, anticonvulsants and nonphytotoxic pesticides, particularly fungicides. Biological activity may reside in the ligand, in the metal or in the complex. Figures 2; references 190: 60 Russian, 130 Western.  
[355-12126]

UDC 541.63+538.113

COORDINATION OF VANADYL ACETYLACETONATE WITH NITROGENOUS DONOR BASES

Novosibirsk ZHURNAL STRUKTURNOY KHIMII in Russian Vol 26, No 3, May-Jun 85  
(manuscript received 25 Apr 84) pp 53-58

ASTASHKIN, A. V., DIKANOV, S. A. and TSVETKOV, Yu. D., Institute of Chemical Kinetics and Combustion, Siberian Department, USSR Academy of Sciences

[Abstract] ESR spectroscopy was employed in studies on hyperfine interactions of unpaired vanadium ion  $VO^{2+}$  nitrogen atoms of selected bases, in order to analyze the spatial structure of such adducts. The determined

values for the hyperfine interactions were found to lie within the 3.6-6 MHz range, suggesting the formation of equatorial adducts of  $\text{VO}^{2+}$  acac<sub>2</sub> with the nitrogenous bases. In terms of forming adducts of decreasing stability, the bases ranked as follows: piperidine>N,N-dimethylaniline>triethylamine>>diethylamine>pyridine, alpha-picoline, quinoline>aniline>1-piperidino-9,10-anthraquinone, 2-dimethylamino-1,4-naphthoquinone>N,N-diethylaniline. Figures 4; references 19: 7 Russian, 12 Russian.  
[369-12172]

UDC 548.736

CRYSTALLINE AND MOLECULAR STRUCTURE OF BIS(ACETATO)-BIS-(AMIDOISONICOTINATO)-DIAQUO-COPPER(II)

Novosibirsk ZHURNAL STRUKTURNY KHIMII in Russian Vol 26, No 3, May-Jun 85  
(manuscript received 25 Jul 83) pp 104-112

TSINTSADZE, G. V., KIGURADZE, R. A. and SHNULIN, A. N., Institute of Theoretical Problems of Chemical Technology, Azerbaijan SSR Academy of Sciences

[Abstract] X-ray structural analysis was conducted on bis-(aceto)-bis-(amidoisonicotinato)-diaquo-Cu(II) to determine the spatial configuration of monoclinic crystals. The octahedral coordination of the copper atom, located in the center of the inversion, is distorted by two oxygen atoms of two acetate groups, two water molecules, and two nitrogen atoms of the isonicotinamide. However, the monoclinic crystals contain the maximum number of possible hydrogen bonds, as do similar structures which contain nicotinamide in place of isonicotinamide. Coordinates are presented for the various atoms of bis-(aceto)-bis-(amidoisonicotinato)-diaquo-Cu(II), as well as nonvalent contacts, geometric parameters of hydrogen bonds, and major intramolecular nonvalent distances, with comparison to related complexes. The structural differences are discussed from the point of view of differences in the position of carboxyamide groups in the pyridine ring of the ligand. Figures 2; references 15: 10 Russian, 1 Czech, 4 Western.  
[369-12172]

UDC 548.737

X-RAY STRUCTURAL STUDIES ON NONVALENT INTERACTIONS AND COORDINATIONS  
IN HETEROORGANIC COMPOUNDS. PART 26. 1-CHLOROMERCURI-2-DIMETHYLAMINOMETHYL-  
FERROCENE

Novosibirsk ZHURNAL STRUKTURNOY KHIMII in Russian Vol 26, No 3, May-Jun 85  
(manuscript received 18 Jul 83) pp 130-135

KUZMINA, L. G., STRUCHKOV, Yu. T., TROITSKAYA, L. L. and SOKOLOV, V. I.,  
Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy  
of Sciences

[Abstract] To further define the secondary bonds of mercury with electro-donor heteroatoms in 1-chloromercuri-2-dimethylaminomethyl-ferrocene, x-ray structural analysis was conducted which demonstrated that the mercury atom is linked covalently with the C atom of the ferrocene nucleus (2.042(6) $\text{\AA}$ ) and Cl atom (2.323(2) $\text{\AA}$ ) in the centrosymmetric dimer. The dimer also involves the formation of a pair of secondary Hg...N bonds (2.772(5) $\text{\AA}$ ) with N atoms of the dimethylaminomethyl substituents. This results in distortion of the linear configuration of the valency bonds of the mercury atom and a CHgCl angle of 169.4(2) $^{\circ}$ . Figures 2; references 22: 1 Serbian, 11 Russian, 10 Western.

[369-12172]

UDC: 541.427

STANDARD ENTHALPY OF FORMATION OF SEVERAL VINYLSILANES

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I  
Khimicheskaya Tekhnologiya in Russian Vol 28, No 7, 1985  
(manuscript received 24 Oct 83) pp 48-50

GADZHIYEV, S. N., GUBAREVA, A. I. and ZHUN, V. I., Department of General  
and Inorganic Chemistry, Kuzbass Polytechnic Institute

[Abstract] An improved combustion method was used to determine the enthalpy of formation of chromatographically pure organosilicon compounds: tetravinylsilane, trivinylsilane and trivinylmethylsilane. The essence of the method consists of evaporation of the substance and combustion of the vapor with oxygen. Calorimetric combustion was conducted in a dynamic bomb calorimeter, the energy equivalent determined by combustion of standard benzoic acid. Standard enthalpies of formation are determined from the experimental values of specific energy of combustion of the vinyl silanes studied. References 4: 3 Russian, 1 Western.

[368-6508]

UDC: 541.49:(546.73+547.441+677.044.3)

ANALYSIS OF ABSORPTION SPECTRA OF SYSTEM Co(II)-DIMETHYLGlyOXIME-OXYMETHYL-SULFINATE BY GAUSSIAN CURVES METHOD

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHOLOGIYA in Russian Vol 28, No 7, 1985  
(manuscript received 30 Jun 83) pp 55-58

RAYZMAN, L. I., TERSKAYA, I. N., SOKOLOVA, I. N. and BUDANOV, V. V.,  
Department of Physical Chemistry, Ivanovo Institute of Chemical Technology

[Abstract] An analysis was performed of the absorption spectra of aqueous Co(II)-H<sub>2</sub>D and Co(II)-H<sub>2</sub>D-OMS [sodium oxymethylsulfinate] systems by the Gaussian curves method. The cobalt dimethylglyoximate and mixed complexes with OMS formed in solutions are found to be catalytically active in reduction of oxymethylsulfinate. Stability constants are calculated.

Figures 4; references 10: 9 Russian, 1 Western.  
[368-6508]

UDC: 536.714:546.82:547.233.2

THERMODYNAMICS OF EVAPORATION OF TITANIUM TETRA DIETHYLAMIDE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHOLOGIYA in Russian Vol 28, No 7, 1985  
(manuscript received 1 Dec 83) pp 115-116

BAYEV, A. K., MIKHAYLOV, V. Ye. and BAYEV, A. A., Department of Analytic Chemistry, Belorussian Institute of Technology imeni S. M. Kirov

[Abstract] Titanium tetra diethylamide was synthesized and purified under a vacuum at 0.133-1.33 Pa, then analyzed for chloride-ion content, which indicated they were absent. The titanium content agreed with that calculated from the chemical formula. Heat of evaporation was determined directly with a standard differential automatic calorimeter. Evaporation enthalpies of Ti[N(C<sub>2</sub>H<sub>5</sub>)<sub>2</sub>]<sub>4</sub> at 393 K was measured as 91.4, 90.8 and 91.1 kJ/mol in three experiments. Figures 2; references 3: 2 Russian, 1 Western.  
[368-6508]

ORGANOPHOSPHORUS COMPOUNDS

UDC 548.737

STRUCTURE OF ORGANOPHOSPHORUS COMPOUNDS. PART 30. X-RAY STUDIES ON  
DIPHENYL(DIETHYLCARBAMOYLMETHYL)PHOSPHINE OXIDE ( $\text{Ph}_2\text{P}(\text{O})\text{CH}_2\text{C}(\text{O})\text{NEt}_2$ ) AND  
ITS MOLECULAR COMPLEX WITH PERCHLORIC ACID ( $\text{Ph}_2\text{P}(\text{O})\text{CH}_2\text{C}(\text{O})\text{NEt}_2 \cdot \text{HClO}_4$ )

Novosibirsk ZHURNAL STRUKTURNOI KHMII in Russian Vol 26, No 3, May-Jun 85  
(manuscript received 23 Jun 83) pp 146-152

ANTIPIN, M. Yu., STRUCHKOV, Yu. T., MATROSOV, Ye. I. and KABACHNIK, M. I.,  
Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy  
of Sciences

[Abstract] X-ray and IR analysis were conducted on diphenyl(diethylcarbamoylmethyl)phosphine oxide (I) and its molecular complex with perchloric acid (II), which demonstrated that the crystals of both compounds are colorless and monoclinic. Graph and tabular data are presented on atom coordinates, valency angles and other geometric parameters (bond lengths, torsion angles), demonstrating the pronounced differences in the geometry and conformation of I and II. Among the important differences are the turns in the P=O and C=O groups relative to the ordinary P-C(1) and C(1)-C(2) bonds. For example, in I the angle of torsion O(1)PC(2)O(2) is 118.2(5) $^\circ$ , and in II its value is only 9.4(2) $^\circ$ , indicating that the bonds O(1)-P and O(2)-C(2) are almost parallel. Such a chelate configuration of these bonds is a prerequisite for extractive and complexing properties of type-I compounds. In II the C(2)-O(2) bond is 0.064 Å longer than in I due to the fact that the H atom of the acid is localized on O(2), while the C-N bond in II (1.311 Å) is much shorter than in I (1.359 Å). Figures 2;  
references 17: 8 Russian, 9 Western.

[369-12172]

STATE-PRIZE CALIBRE OF WORK ON PHOSPHORUS-32-LABELLED COMPOUNDS

Moscow IZVESTIYA in Russian 24 Aug 85 p 3

[Article by: V. Koptyug, academician, chairman of the Siberian Department of the USSR Academy of Sciences]

[Abstract] The author discusses the background of the work entitled "Development of Technology and Organization of Industrial Production of Compounds Marked with Phosphorus-32 for Physical-Chemical Biology" and its significance for genetic engineering. The work, which was done at the Uzbek Academy of Sciences' Institute of Nuclear Physics, has been nominated for the 1985 USSR State Prize. The author explains how in a very short time, the technology was developed for industrial production of super-pure orthophosphoric acid based on phosphorus-32, freeing the country from dependence on imports of this substance from the West. Subsequently 12 key preparations based on phosphorus-32 were put into production for the needs of research in physical-chemical biology and genetic engineering. It is mentioned that the USSR now has them available for export.

FTD/SNAP  
CSO: 1841/19

UDC 543.422.25+539.143

PSEUDOROTATION IN CRYSTALLINE  $(\text{Cl}_3\text{PNAr})_2$  DIMERS: EFFECTS ON SPIN-LATTICE RELAXATION OF UNINVOLVED NUCLEI

Moscow KHMICHESKAYA FIZIKA in Russian Vol 4, No 8, Aug 85  
(manuscript received 10 Jul 84) pp 1076-1082

KIBRIK, G. Ye., KOZLOV, E. S., KYUNTSEL', I. A., MOKEYEVA, V. A., POLYAKOV, A. Yu. and SOYFER, G. B., Perm State University imeni A. M. Gorky

[Abstract]  $^{35}\text{Cl}$  NQR (nuclear quadrupole resonance) and  $^1\text{H}$  NMR (nuclear magnetic resonance) spectroscopies were used to analyze pseudorotation in four crystalline phosphazo compounds,  $(\text{Cl}_3\text{PNAr})_2$ , where Ar =  $\text{C}_6\text{H}_5$  (I),  $\text{C}_6\text{H}_4\text{Cl}-o$  (II),  $\text{C}_6\text{H}_4\text{Cl}-m$  (III), or  $\text{C}_6\text{H}_4\text{Cl}-p$  (IV). Analysis of the resonance signals demonstrated that the thermoactivated process in which the Cl atoms of the P-Cl bond are involved consists of a positional exchange of the axial and equatorial Cl atoms, i.e., a pseudorotation. The pseudorotation in this class of dimers represents an intramolecular exchange process with an equal probability of participation of all three P-Cl - Cl atoms. The effects of temperature were used to calculate the energies of activation for each compound as 13.7 kcal/mole for I, 12.7 kcal/mole for II, 14.9 kcal/mole for III, and 18.3 kcal/mole for IV. Figures 2; references 18: 8 Russian, 10 Western.

[2-12172]

PESTICIDES

UDC 547.26'118:541.691:577.152.311.042

ROLE OF ESTERASES IN EXPRESSION OF TOXIC PROPERTIES OF THIOORGANOPHOSPHORUS  
INSECTOCARICIDES CONTAINING MERCAPTOACETIC ACID FRAGMENT

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 11, No 7, Jul 85  
(manuscript received 31 Jan 85) pp 957-962

MAKHAYEVA, G. F., YANKOVSKAYA, V. L., ODOYEVA, G. A.\*, SHESTAKOVA, N. N.\*,  
KHOVANSKIKH, A. Ye.\*, MASTRYUKOVA, T. A.\*\*, SHIPOV, A. E.\*\*, ZHDANOVA, G. V.\*\*,  
and KABACHNIK, M. I.\*\*; Institute of Physiologically Active Compounds,  
USSR Academy of Sciences, Chernogolovka, Moscow Oblast; \*Institute of  
Evolutionary Physiology and Biochemistry imeni I. M. Sechenov, USSR Academy  
of Sciences, Leningrad; \*\*Institute of Heteroorganic Compounds  
imeni A. N. Nesmeyanov, USSR Academy of Sciences, Moscow

[Abstract] The dithiophosphonate  $\text{Me}(\text{EtO})\text{p}(\text{S})\text{SCH}_2\text{SCH}_2\text{COOMe}$ , its activation metabolites (analogs with P=O, with S=O, and with both P=O and S=O) and a detoxification product (-COOH) were interacted with rat liver carboxylesterase, with acetylcholinesterase from human erythrocytes, with butyrylcholinesterase from horse blood serum, and with carboxylesterase from nerve tissue and fat bodies and cholinesterase from nerve tissue of the American cockroach. All these esterases rapidly hydrolyzed the basic compound to the nontoxic -COOH analog. On the other hand, the analogs with P=O were not hydrolyzed by the carboxylesterases, but inhibited them irreversibly. Carboxylesterase of aphids only weakly hydrolyzed the basic compound, agreeing with its relatively high toxicity against them; apparently the situation is similar with spider mites, with the basic metabolism being oxidative, not hydrolytic.

References 16: 10 Russian, 6 Western.

[357-12672]

PETROLEUM PROCESSING TECHNOLOGY

GAS USED IN MOTOR VEHICLES INSTEAD OF GASOLINE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 9 Jul 85 p 2

[Article by V. Ilin, Ukhta, Komi ASSR: "Gas Instead of Gasoline"]

[Text] Komi's first gas-filling compressor station has started operating. The new station was built at the highway with the highest freight traffic volume which connects Ukhta with the airport, Sosnogorsk and the fields of the "Tebuk-neft" Administration. It will be filling up to 500 motor vehicles a day with natural or petroleum gas. One filling will be enough for over 200 kilometers. The first 50 compressed gas operated vehicles have already been delivered to the freight services of Ukhta. Their number will be steadily increasing. This will make it possible to lower the use of gasoline and other types of liquid fuels and to lower the air pollution level.

10233  
CSO: 1841/347

## PROGRESS ON YAMBURG-YELETS GAS PIPELINE

Moscow SOTSIALISTICHESKAYA INDUSTRiya in Russian 17 Jul 85 p 1

[Article by A. Suldin, TASS correspondent: "Pipeline Under Construction, Pipeline Operating"]

[Text] Considerable progress has been made by the builders of the transcontinental gas pipeline Yamburg-Yelets-1. This 3,150-kilometer pipeline starts at a large field beyond the Polar Circle and ends in Lipetsk Oblast. Yesterday its builders completed one half of the pipeline: the pipes are welded, insulated and laid in the trench. This was reported by the Main Dispatcher Administration of the Ministry of Construction of Petroleum and Gas Industry Enterprises.

The Yamburg-Yelets gas pipeline is an above-plan construction project of the five-year plan. The preceding six routes of pipeline from Urengoy were constructed considerably ahead of schedule. By saving almost one year of the construction time, it was possible to start the construction of the above-plan pipeline.

Such a high acceleration of work was the result of effective use of advanced machinery and bold engineering solutions. The press center of the ministry helped greatly in the dissemination of advanced experience. Jointly with a number of newspapers, such as GORKOVSKAYA PRAVDA and Perm ZVEZDA, field editorial offices were organized. This made it possible to effectively report all innovations and generalize advanced experience.

The Yamburg-Yelets pipeline has its special characteristics. Individual sections of it are being put into operation stage-by-stage. For example, 250 kilometers of the pipeline already can receive gas and start operating in the gas-supply system of the country. This means many millions of cubic meters of gas supply to the enterprises and large industrial center of the country above plan.

The pace of the construction of this above-plan gas pipeline is increasing. The builders are determined to fulfill their increased socialist pledges, completing all jobs on the Yamburg-Yelets line, as well as constructing a number of compressor stations for this pipeline by the 27th Party Congress.

The work at other construction sites conducted by the subdivisions of the ministry is also progressing efficiently. The six-month plan was completed successfully. It is very important that the builders completed their tasks for the oil fields of Western Siberia.

10233  
CSO: 1841/347

## PROBLEMS WITH OIL EXTRACTION IN TYUMEN OBLAST

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 7 Aug 85 p 2

[Article by Yu. Belanov and V. Kremer, special correspondents: "Difficult Oil", Tyumen-Moscow]

[Text] It is already the third year that Glavtyumenneftegaz [Tyumen Main Administration of the Petroleum and Gas Industry] has not been fulfilling the state plan. Now, in seven months, its debt has already exceeded fifteen million tons. It can be easily imagined how substantial these losses are for the economy. The millions of tons which were not delivered had been included in the calculations of the plan and the fuel and energy balance of the country was based on them.

What happened there? This question was asked by us in the offices of the Minnefteprom [Ministry of the Petroleum Industry] and thousands of kilometers away from Moscow, where the fate of the oil-related five-year-plans is being swayed. Generally, specialists evaluate the situation identically. We were told that their lagging was not a surprise. The oilmen were unable to prepare for the new, more complex stage of the development of the West Siberian complex when oil does not flow by itself, but has to be literally extracted from the depths of the earth. Let us mention that this stage is just as inevitable in the biography of any oil region as the changes of seasons.

Of course, it is easy to judge yesterday's errors today when they can be seen by everybody. It is quite normal that almost everyone with whom we met were speaking not so much about what had been overlooked and undone as about what has to be done now and made up for.

The deputy minister of the petroleum industry and chief of the Glavtyumenneftegaz, V. Grayfer, told us that this year it is planned to develop eleven new oil fields. Eight of them have already started producing, although their yield is expected to be relatively small for the time being, of the order of one million tons. However, in the next five-year-plan, tens of millions of tons of oil will be produced in these new areas. This will make it possible to relieve to a considerable degree Samotlor and other well-known fields.

We familiarized ourselves with the progress report on projects under construction. Automobile roads, electric power transmission lines and pipelines have already been completed there. Rig-building and drilling teams will move there: The volume of drilling jobs has to be doubled next year.

Changes are noticeable first of all at the headquarters of the Tyumen oilmen, Glavtyumenneftegaz. They started strengthening technological and technical services which had been kept in the background during the blowout period. A central engineering and technological service was organized to receive the entire current production information.

It was also necessary to rearrange the personnel. Not all administrators understood that today it is not sufficient to see where the reserves are, but it is necessary to know how to take these reserves. N. Sergeyev, chief of one of the leading Samotlor administrations "Nizhnevartovskneft", was one of them. In the course of several years he "raised the question" at all levels about the necessity of switching the wells to the advanced gas-lift method of operation, arguing that this will considerably increase the yield. However, when the new management of the new administration the trust "Nizhnevartovskneftstroy" sent all their available personnel for the installation of the gas-lift equipment and a month later one hundred wells were ready, the oil field men, who were not used to such efficiency, were taken by surprise. This led to series of losses.

At the present time the Nizhnevartovsk administration is headed by a new chief. The order relieving N. Sergeyev of his post says: "to be dismissed for not taking appropriate measures for increasing the output of oil and distorting the actual state of affairs". This was a strong wording. However, even without such drastic measures, it is, evidently, impossible to achieve a decisive change in the conscience of people and ensure the unity of words and deeds.

Organizational and psychological changes are, of course, necessary, and it is hoped that, in the final analysis, it will have a positive effect on the results of work. However, fifteen million tons of indebtedness in oil cannot be disregarded. This oil is necessary today. And the lagging of the Tyumen oilmen is not decreasing but, on the contrary, is increasing. The daily output curve nervously jumps up and down along the axial line.

According to the chief of the oil extraction administration of Glavtyumenneftegaz, V. Kudrin, there is a reason for this. Not a single day passes by without a power failure. When there is no power, the wells, pumping stations and drill sites stay idle.

In the last days of July, the work was disrupted by two serious failures in the electric power networks which occurred one after another. This year, the direct losses of oil due to interruptions in power supply amounted to 340,800 tons. This is an impressive figure, but it is only 2-3 percent of their total indebtedness. The main reason should be sought elsewhere.

At Samotlor, at the 666-th well cluster, we met U. Khugaliyev, senior operator of the underground maintenance team who arrived at the Ob region from Groznyy. A new electric submersible unit was just lowered into the well. All they had to do for the oil to start flowing was to connect it to the field pipeline. However, the young operator was unhappy.

According to him, as soon as they start one well, another well fails and they never stop repairing.

At the Tyumen fields, every fifth of the drilled wells stays idle for various reasons. It has been calculated that if 2,570 wells idling longer than the normative time are put in operation, it would be possible to obtain more than ten million tons of oil, or two thirds of their present indebtedness, before the end of the year. This is their main reserve. You just come and get it!

However, it is not so simple to get it. The maintenance teams of the main administration, of which there are two and a half times more than the oil extracting teams, have no time to restore idling wells. At this difficult time, oilmen from Groznyy, Baku, Kuybyshev, Krasnodar, Almetyevsk and Ufa came to the aid of the Tyumen oilmen.

Day and night, Aeroflot has special trips to deliver flying teams to Siberian cities. More than 50,000 workers engaged in oil production and drilling work for two weeks in the north and two weeks at home. They perform 35-40 percent of the total volume of drilling and approximately one fourth of the well maintenance work. There is no doubt that such help is indispensable.

The shift method is expensive and, therefore, it is particularly important to see to it that such help is effective.

There occur quite a few problems in Nizhnevartovsk when one hundred maintenance teams arrive in addition to their 150 teams.

We attended a selection conference at "Nizhnevartovskneftegaz", the largest oil enterprise of the country. General Director L. Filimonov was receiving reports about the work of teams sent to various sites during the preceding 24 hours.

The "Belozerneft" Administration could not send two teams of Kirgiz maintenance workers due to the absence of machines for their shift... At "Priobneft", Perm and Stavropol oilmen were idled for 68 hours due to shortage of special equipment... Udmurt and Nizhnevолжск idled for 17 hours waiting for the drilling mud... The total idling time of contracted teams was over 500 hours in one day.

When you hear these sad reports, you cannot help but come to the conclusion that not everybody had a sense of responsibility with respect to the workers sent to Tyumen. Somebody sent people without any equipment, and somebody else with an equipment that was ready to fall apart. The Nizhnevartovsk enterprise had to provide additional instruments and lifts to the arriving teams, while every set of equipment was needed for their own people.

One hundred teams is more than 2,000 people. They have to be trained, provided with housing, food, transportation and everything necessary for efficient work. It can be easily imagined what problems have been facing the headquarters for the organization of work of contracted teams created in the association.

Recently, we checked the work of shift teams from "Azneft" [Azerbaijan Oil Industry Association] during their night shift. According to V. Aliyev, chief of the headquarters, the picture was not very attractive. For example, we stopped by at foreman Zagorskii's car, the shift crew were asleep. We awakened the assistant driller and asked why they were not lifting the pump pipes. He said

that they had no lifter operator. In the neighboring team, everyone was also asleep; there was a machine operator, but pipes were not delivered...

The one hundred maintenance teams organized by order of the Ministry of the Oil Industry did not produce any real increase in the oil output. Moreover, the number of idling wells as of the first of July increased in comparison with those as of the first of January.

It is, probably, not enough to redistribute the labor resources of the industry in favor of a promising region. By increasing the number of "flying teams", it is possible only to alleviate the acuteness of the occurring problems for a short time. Moreover, the scope of the shift-expedition method, evidently, has its limits.

During the initial stage of its development, Western Siberia was something like a testing ground where many technical and technological innovations in oil production were tested in practice and received recognition. It was chiefly for this reason that it was possible to create here in a short period of time the largest fuel and energy complex literally from nothing. However, in recent years, the traditions of innovations of the pioneer miners, unfortunately, have been lost in spite of the fact that new solutions based on the achievements of the scientific and technical progress are needed now perhaps more than ever before.

At the "Surgutneftegaz" Association we were shown an interesting new item: a hydraulic oil-well pump. Its experimental specimen operated nearly 900 days, almost twice as long as the widely used electric submersible pumps. According to V. Bogdanov, general director of the association, having larger number of such pumps would solve their repair problems. However, the prospects of their series production, so far, do not go beyond vague promises.

Our newspaper already reported the fact that the level of field equipment does not correspond to the modern requirements. This is hardly the fault of the machine builders alone. The consumer should also share the responsibility for this. As was mentioned at a recent enlarged board of the Ministry of the Petroleum Industry, the ministry is not sufficiently persistent and consistent in the implementation of its policy of technical reequipment of its enterprises. This is felt particularly acutely by Siberian oilmen. On the whole, there formed a substantial gap between the volumes of oil extraction and the scientific and technical base which makes it possible to maintain the attained level and develop the industry further.

Judging by the reports, more than seventy percent of the Tyumen oil is obtained from automated fields. However, under close examination, the picture appears to be much more modest. Less than one third of the operating wells are connected to the remote control system. Moreover, indications of the instruments cannot always be completely trusted: their automated devices are often unreliable.

Signals from the group measuring units "Sputnik" are sent to a display at which a woman operator is on duty around the clock. Up to ten wells are connected to each "Sputnik". When there is an unexpected failure, for example, a cable

breakdown of an electric pump, the operator would not know which of the wells stopped operating. It is, therefore, impossible to achieve the maximum yield from each well if it is not monitored individually.

The oil production section in the north consists of dozens of square kilometers of marsh-ridden taiga areas. It is not too bad in winter, but in summer some well clusters are inaccessible because they are surrounded by water. Under these unusual conditions, only automatic devices can provide information about the amount of oil produced by a team during one shift or in 24 hours. Without such information, the work is done blindly. Glavyumenneftegaz does not record oil output in 130 of the 212 teams. If you tell this to oilmen of old regions they will not believe you.

The part of deposits with the so-called hard-to-extract oil is steadily increasing in the register of Siberian deposits. For the most part, "the cream" has already been removed, and it is the turn of less productive underground reserves with a much more complex geological structure. How can you gain access to these riches if the industrial science did not offer any effective project or development schemes? Even at Samotlor, areas with such difficult oil still remain untouched.

The use of the already known new methods of increasing the yield of oil strata also has not gone beyond individual experiments, although these methods can be most advantageous. According to the calculations of specialists, increasing the oil recovery of the Tyumen fields only by two or three percent (which, incidentally, is very realistic) is equivalent to exploiting hundreds of millions of tons of additional reserves. Such an increase is worth struggling for!

The new stage of the development of the main oil-producing region of the country presents many complex problems. However, we still have a reason to conclude these remarks on an optimistic note.

At the "Nizhnevartovskneftegaz" Association we saw a great achievement: "Belozerneft" and "Chernogorneft" administrations achieved the planned level of daily production. The production of oil in one of the lagging administrations, "Varyeganneft", increased by 1,000 tons a day. The teams of the "Yuganskneftegaz" and "Surgutneftegaz" associations are producing ahead of the plan... All this, of course, inspires hopes.

However, it is, of course, necessary to solve the problems of the difficult Tyumen oil. This must be done with the use of the entire resources of the achievements of science and technology. There is no other way now.

10233  
CSO: 1841/347

## GAS CONSERVATION DEVICE

Moscow SOTSIALISTICHESKAYA INDUSTRIYA in Russian 10 Aug 85 p 1

[Article by Professor G. Zarnitskiy, Department of Heat and Electric Power Stations of the Polytechnic Institut, Krasnodar: "How Flares Can Be Extinguished"]

[Text] The author proposes a solution which can save millions of rubles and billions of cubic meters of gas.

Flares in the sky above oil fields are visible from far away. They are burning day and night. Every year, more than ten billion cubic meters of gas is burned in them. Precious resources fly into the sky together with smoke, considerably polluting the air.

Much is being done to reduce the number of flares, but still we are far from completely solving the problem. The reason is that the technical policy of using petroleum gas was based on the construction of large gas-processing plants at large oil fields. Unfortunately, their construction time is long: in the European part of the country -- seven years, and in Western Siberia -- as long as twelve years. For example, the Tuymazinskiy Plant in the Bashkir ASSR was constructed in five years, Neftekumsk Plant in Stavropolskiy Kray -- in eight years, while the Perm Plant -- ten years. While the plants were under construction, more than 50% of the gas reserves were burned in flares at the fields. Now, 3-5 years after the completion of the construction, i.e., 10-15 years after the beginning of the development of the fields, most of the gas-processing plants are beginning to feel a shortage of raw materials.

A paradoxical question arises: is it necessary to build these large enterprises? Particularly because they will not ensure complete utilization of gas, but utilize only gas of the first stage of separation. The technology of the development of an oil field is considered optimal only if the associated gas is completely used on the spot or is transmitted to the gas line system of the country.

This can be achieved only if special technological installations are constructed at the fields or with a complete cycle of the extraction and preparation of petroleum products. These small-size facilities can, to a certain degree, replace large gas-processing plants.

A small-size unit costs not more than one million rubles. About ten such units will replace one plant, i.e., their total cost will be ten million rubles, while a plant would cost 40 million rubles. It is true that these units have also a drawback: a lower coefficient of the extraction of the target product than that of the plants. However, considerable advantages are created due to the speed with which it is possible to put them in operation (ten months at most) and because the required products can be obtained from the first year of the development of the field. Moreover, after the plant starts operating, the small-size unit can be quickly transferred to other fields. All this opens up wide possibilities for combining the extraction of oil and associated gas, extraction of gas condensate and obtaining motor fuels from it into a single complex.

Such a unit (with an air-driven screw engine) has been developed by a team of scientists of the Krasnodar Polytechnic Institute with participation of one of the institutes of the petroleum industry. It is intended for ensuring wasteless energy-conserving technology of oil and gas extraction. It is protected by 15 patents and does not have any analogs in the world practice. Six experimental and two experimental-industrial units have been manufactured and the first series industrial unit is being installed. Does it mean that it will be used widely?

Not at all. This requires changing certain factors which substantially hinder the scientific and technological progress in the oil industry. It is, primarily, the fact that oilmen are not interested in using such units. The point is that the cost of the raw gas extracted from petroleum is quite often equal to the cost of conditioned gas prepared for transportation. For this reason, managers of extracting enterprises overlook the fact that nonconditioned gas is fed into the gas-pipe system. Why create more problems?

In short, something should be done for the field men to want to approach the problem of gas preparation more rationally. Of course, they should reexamine the problem of the expediency of constructing large gas-processing plants, having redistributed capital investments in favor of small-size and less expensive units which will make it possible to extinguish the flares during the first year of the development of fields.

There is another quite important point. As has already been said, these units must ensure not only a wasteless, but also an energy-conserving technology. What does it mean?

At the present time, the energy supply scheme for the fields of northern and northeastern regions of the country is questionable. The system of centralized energy supply adopted here is too expensive and not economical. The construction cost of one kilometer of high-voltage electric power transmission lines with voltages of 110-500 kilovolts is two and a half times more than the analogous indexes in the central regions of the country. The cost of electric energy and the specific expenditures per unit of the output product is high. Moreover, the reliability of power supply in these regions is lower due to failures connected with the permafrost and wind conditions.

Thus, if small-size units are combined with the modular gas-turbine electric power stations which are available at the fields, as well as devices for the production of motor fuels from the gas condensate, the situation can radically change. The gas which used to be burned in flares will be feeding electric power stations, as a result of which there will be no necessity in a centralized power supply.

Thus, a wide use of units for gas preparation can have a considerable national economic effect of at least one million rubles per unit. The first of these units is being installed in the "Komineft" Association, but it is done slowly and with delays. In order to speed this up, it is necessary to remove all the above-mentioned barriers along the way of this effective innovation.

10233  
CSO: 1841/347

UDC 547.14+66.094.1.16.19

INTEGRATED PROCESS OF OBTAINING CYCLOPENTENE AND NORBORNENE FROM LIQUID PYROLYSIS PRODUCTS

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 7, Jul 85  
pp 36-39

GASANOV, A. G., MEKHTIYEV, S. D., SULEYMANOVA, E. T., KASUMOV, L. I.,  
PASHAYEVA, F. A., MIRGASANOVA, M. I. and ALIYEV, R. R., INKhP [Institute  
of Petrochemical Industry?], AzSSR Academy of Sciences

[Abstract] The C<sub>5</sub> fraction of liquid pyrolysis products contains cyclopentene and cyclopentadiene, which can be reacted with ethylene to give norbornene. Catalytic poisoning can be avoided by hourly cycling the catalyst into a regeneration regime. After 140 cycles, yields dropped less than 10%; although the proportion of cyclopentadiene rose slightly at the expense of cyclopentene side products dropped from 13.6 to 8.6%. Total yield of cyclopentene and closely-related compounds was 86.2 wt% of the potential cyclopentadienes in the raw fraction. A schematic of the process is provided along with optimal material balances, specified temperature and pressure conditions, and reaction times. The process uses standard equipment and inexpensive catalysts and reactants. It does not form toxic side products or contaminated waste streams. Figures 1; references 3 (Russian).

[378-12672]

PHARMACOLOGY

UDC 612.822.1:577.352.465

REGULATOR CATION-BINDING CENTERS OF OPIATE RECEPTORS AS POTENTIAL-DEPENDENT CALCIUM CHANNELS OF NEUROMEMBRANE

Moscow BIOORGANICHESKAYA KHIMIYA in Russian Vol 11, No 7, Jul 85  
(manuscript received 18 Feb 85) pp 984-986

PORODENKO, N. V., ZAYTSEV, S. V.\* and VARFOLOMEYEV, S. D.\*; Chemistry Faculty, Moscow State University imeni M. V. Lomonosov; \*Interfaculty Problem [Basic Studies] Scientific Research Laboratory of Molecular Biology and Bioorganic Chemistry imeni A. N. Belozerskiy

[Abstract] This report is posed as a question. Measurement of the transport of  $^{45}\text{Ca}^{2+}$  into rat brain synaptosomes showed the equilibrium constant of  $\text{Ca}^{2+}$  binding at the neuromembrane potential-stimulated calcium channel was  $K_M = 0.27 \pm 0.04$  mM. The Ca ions had an inhibiting action on the high-affinity receptors of tritiated morphine. Dissociation constants were also determined for transition metal ions with the high-affinity morphine receptors and with high- and low-affinity receptors of a tritiated enkephalin. Although Verapamil acts as a Ca antagonist, it showed no effect on the low-affinity receptors for the enkaphalin; at the high-affinity receptors, it inversely inhibited the binding of this ligand, but did not compete with Cations at the cation-binding part of the receptors. Apparently the binding centers for Ca on the ion channel do not coincide with the regulator cation-binding parts of opiate receptors. Likewise, the normal sequence of competition by metal ions does not hold for either the enkephalin or morphin receptors. Further,  $\text{Zn}^{2+}$  ions inhibit Ca transport, but do not affect the binding of enkephalin at the low-affinity sites and do not compete with Ca ions at the cation-binding part of the high-affinity receptors. Overall, the results support the conclusion that the regulator cation-binding sites of opiate receptors do not coincide with binding sites for Ca ions on the potential-dependent Ca channels of neuromembranes. Figures 2;  
references 9: 4 Russian, 5 Western.

[357-12672]

POLYMERS AND POLYMERIZATION

SOVIET-JAPANESE SYMPOSIUM ON CABLE INSULATION

Moscow KOMMUNIST in Russian 12 Sep 85 p 2

[Excerpt] Leading specialists of enterprises of the All-Union Electric Cable Association of the USSR Ministry of the Electrical Equipment Industry discussed current problems of the cable industry with specialists of the Japanese firms "Sumitomo Bakelite" and "Sumitomo Corporation". About 20 papers and reports on the problem of reliability and reduced combustibility of cable insulation were presented at a joint symposium in Yerevan.

Candidate of Technical Sciences G. Meshchanov, first deputy director of the All-Union Scientific Research Institute of the Cable Industry, said this about the joint work and results of the symposium:

"As a result of joint work by Soviet and Japanese specialists, new materials have been developed for specific operating conditions of cables, particularly materials that are resistant to cold (temperatures as low as minus 40 degrees) and to heat (temperatures as high as plus 120 degrees). The "Sumitomo Bakelite" firm is a traditional supplier of polyvinylchloride plastic compounds to cable manufacturers of the Soviet Union. Chemical products necessary for the production of these compounds are purchased by the Japanese firm from the USSR.

"The symposium was devoted to problems of studying and employing polyvinyl-chloride compounds which have high resistance to the effects of fire."

PTD/SNAP  
CSO: 1841/19

EFFECT OF IRRADIATION ON HETEROGENEITY OF POLY(VINYLDENE FLUORIDE)-  
POLY(METHYL METHACRYLATE) MIXTURE

Moscow KOLLOIDNYY ZHURNAL in Russian Vol 47, No 3, May-Jun 85  
(manuscript received 29 Nov 83) pp 612-616

LIPATOV, Yu. S., SHILOV, V. V., GOMZA, Yu. P., BLIZNYUK, V. N. and  
BOYARSKIY, G. Ya., Institute of Chemistry of High-Molecular Weight Compounds,  
UkSSR Academy of Sciences, Kiev

[Abstract] The heterogeneity of a 1:1 weight mixture of poly(vinylidene fluoride) with molecular weight 90,000 and poly(methyl methacrylate) with molecular weight 80,000 irradiated with  $10^5 - 1.5 \times 10^8$  rad of  $\text{Co}^{60}$  gamma radiation was studied with X-ray diffraction. The  $<10^6$  rad irradiation caused degradation of the mixture components but the mixture homogeneity was maintained. The  $>10^6$  rad irradiation caused colloidal-size poly(vinylidene fluoride) separation and the mixture heterogeneity increased.  
Figures 4; references 11: 4 Russian, 7 Western.  
[304-12928]

UDC 541.18.046

STABILIZATION OF DISPERSE SYSTEMS BY WATER-SOLUBLE POLYMERS

Moscow USPEKHI KHIMII in Russian Vol 54, No 7, Jul 85 pp 1100-1126

BARAN, A. A., Institute of Colloid Chemistry and Water Chemistry  
imeni A. V. Dumanskiy, UkSSR Academy of Sciences, Kiev

[Abstract] Experimental and theoretical studies since 1975 on the mechanism by which uncharged or partially charged water-soluble polymers stabilize disperse systems are reviewed, with particular attention to measurement and theoretical calculation of interactive forces. The nature of this stabilization, and its dependence on surface interactions, structure and molecular weight are discussed, as well as methodology and stabilizer dose-effect relationships. The effects of molecular wt., concentration of the solid phase, particle dimensions, temperature and degree of surface on the extent of stabilization are covered. Theoretical

approaches used to describe this stabilization involve Van der Waals forces, repulsive forces in the electronic double layer, interactions between adsorbed macromolecules and solvation of the dispersed phase. Mechanisms proposed to describe the stabilization of real dispersions by nonionic polymers involve the energy of interaction of particles with adsorbed high-molecular-weight compounds. Direct measurement of the repulsive forces between adsorbed high-molecular-weight compounds has partially confirmed some theoretical constructs. Figures 11; references 141: 69 Russian, 72 Western.  
[355-12126]

UDC 678.742.4

#### FUNCTIONAL DERIVATIVES OF POLYISOBUTYLENE

Moscow USPEKHI KHIMII in Russian Vol 54, No 7, Jul 85 pp 1208-1229

SANGALOV, Yu. A. and YASMAN, Yu. B., Institute of Chemistry, Bashkir Branch, USSR Academy of Sciences, Ufa

[Abstract] Methods for obtaining polyisobutylene with various terminal functional groups and new uses for modified polyisobutylene are reviewed. The ratio of trisubstituted to vinyl terminal groups in polyisobutylene has been reported to vary widely, depending on the conditions of polymerization and the nature of the catalyst. When isobutylene is polymerized in the presence of anisole, alkylphenols or alkylbenzenes, aromatic chain termini can result. Chain transfer also occurs in the presence of alkyl-chlorides and alpha-olefins. Cleavage of the initiator counterion, with incorporation of a portion into the polymer chain terminus, occurs with stannous chloride/phenol and several other weak Lewis acids. Alpha,omega-dichloro-alpha,omega-divinyl- and alpha-vinyl-omega-chloro-polyisobutylene can be prepared with these catalysts at low temperatures. Aromatic groups can also be introduced. Thermocatalytic polymer destruction in the presence of aluminum chlorides and aromatic hydrocarbons, as well as oxidative copolymer cleavage, also permit functionalization of polyisobutylene. Once polyisobutylenes with reactive terminal groups have been produced, they can be further transformed into other derivatives. Carboxyl- and vinyl-containing copolymers are important intermediates in these reactions. Functionalized polyisobutylenes exhibit increased resistance to oxidation, antioxidant properties and increased viscosity, making them valuable oil and coolant additives. They are also used as plasticizers, ointments, packings, films and sealants, and in the synthesis of new types of rubbers and block-copolymers. References 102: 44 Russian, 1 Polish, 57 Western.  
[355-12126]

UDC 541.64:547.316.4

POLYMERIZATION OF VINYLACETYLENE COMPOUNDS UNDER ACTION OF PALLADIUM SALTS  
IN CONDITIONS OF HOMOGENEOUS CATALYSTS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 8, Aug 85  
(manuscript received 29 Dec 83) pp 1681-1684

GRIGORYAN, S. G., ARZUMANIAN, A. M., GROMOV, A. M., MARTIROSYAN, G. V. and  
MATNISHYAN, A. A., Armenian Branch of All-Union Scientific Research  
Institute of Reagents and Especially Pure Chemical Compounds

[Abstract] Polymerized compounds included the tertiary alcohols dimethyl-vinylethynylcarbinol and dimethylethynylvinylcarbinol and the primary alcohol vinylethynylcarbinol. Polymers were prepared using 0.045 moles of the monomer and 0.0003 moles Pd chloride or acetate in 10 ml organic solvent at 80-120° C for 8 h. Infrared spectroscopy indicates the Pd compounds first form a  $\pi$ -complex with the triple bond and coordination bonds with the associated solvent. As the polymer chain grows, the diffusion of charge along the conjugated double bonds weakens the polarity of the Pd bond with the  $\alpha$ -carbon and gradually limits the growth of the chain, leading to low-molecular weight polymers. Further, the strength of the Pd-C bond with the associated ligands increases, lowering the reaction rate. The brownish polymeric powders obtained are paramagnetic and enter into diene reactions with maleic anhydride, indicating the trans-nature of the bonding. Thermal treatment of some of the polymers in dioxane at 200-250° C apparently leads to interaction of vinyl side chains and the consequent formation of a more stable staircase structure. References 14 (Russian).  
[352-12672]

UDC 541.64:536.4

TEMPERATURE TRANSITIONS IN INTERPENETRATING POLYMERIC NETWORKS BASED ON  
EPOXIDE RESIN AND POLYURETHANE IONOMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 8, Aug 85  
(manuscript received 29 Dec 83) pp 1690-1693

LIPATOV, Yu. S., SERGEYEVA, L. M., KARABANOVA, L. V. and LUTSYK, Ye. D.,  
Institute of Chemistry of High Molecular Weight Compounds, UkrSSR Academy  
of Sciences

[Abstract] Epoxy resin ED-20 was hardened with maleic anhydride catalyzed by 2,4,6-tris(dimethylaminomethyl) phenol. The polyurethane ionomer was synthesized from polyoxypropylene glycol; 2,4-toluylenediisocyanate; 2,2'-dimethylethanolamine; and 1,5-dibromopentane. The interpenetrating polymeric network was then formed by simultaneous polymerization at 353° K. The transition temperatures for individual polymeric networks of the epoxy resin and the polyurethane ionomer were 333° K and 319° K respectively. For interpenetrating networks, two transition temperatures

were observed, confirming the presence of a two-phase structure. For the epoxy resin network, the transition temperature was lower by up to 20°, with minimums at approximately 10% and 90% epoxy resin compositions. For the polyurethane ionomer network, the transition temperature increased smoothly to approximately 253° K as the proportion of epoxy resin was increased to 80%. The temperature data also indicated the presence of a combined phase region, apparently with a relatively large free volume and a correspondingly more friable structure. This was especially noticeable when the percentage composition of one of the components was low. At intermediate compositions, phase stratification led to a denser product. Figures 2; references 20: 13 Russian, 7 Western.

[352-12672]

UDC 541.64:547.398

EMULSIFIER-FREE EMULSION POLYMERIZATION OF ACRYLAMIDE IN PRESENCE OF SULFOCOMPLEX OF MANGANESE (III)

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 8, Aug 85  
(manuscript received 29 Dec 83) pp 1694-1696

KOKHRIN, S. A., SHIBALOVICH, V. G., NIKOLAYEV, A. F. and CHUDNOVA, V. M., Leningrad Technologic Institute imeni Lensovet

[Abstract] Emulsion polymerization was carried out under argon at 10-20° C in water:toluene dispersions having ratios varying from 1:1 to 1:4 by volume. The reaction was initiated by manganese alkylbenzenesulfonate-bis-acetylacetone and the kinetics measured gravimetrically by precipitating emulsion samples in acetone with added hydroquinone. The initiator shows a high degree of surface activity, lowering the surface tension at the air-water interface to  $38 \times 10^{-3}$  N/m and at the water-toluene interface from  $31.6 \times 10^{-3}$  to  $2.0 \times 10^{-3}$  N/m, facilitating both the formation of an effective emulsion and diffusive interphase mass transfer. The kinetic curves and the energy of activation of the reaction (60.3 kJ/mole) indicate high conversion and rapid reaction rates, following free-radical polymerization models. The manganese complex apparently dissociates through an aquacomplex to form a free radical which initiates the polymerization. This begins at the interphase boundary and continues in the water phase. The colloidal stability of the dispersed polymer is due to the sulfoanions which form during dissociation of the manganese complex. Figures 4; references 8: 5 Russian, 3 Western.

[352-12672]

UDC 541.64:542.954

## SYNTHESIS AND SOME PROPERTIES OF BLOCK-COPOLYARYLATEURETHANES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 8, Aug 85  
(manuscript received 9 Jan 84) pp 1717-1723

SIMONENKO, T. S., VASNEV, V. A., VINOGRADOVA, S. V. and KORSHAK, V. V.,  
Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR  
Academy of Sciences

[Abstract] Oligoarylates were formed by reacting bisphenols (phenolphthalein, dichlorodian, or dian) with the dichloroanhydride of terephthalic acid; molecular weights ranged from 780 to 3100 depending on the amount of excess chloroanhydride. Thermal stability depended directly on molecular wt., with the softening temperature ranging from 120 to 300° C. Copolymers were formed by reacting these oligoacrylates with aromatic, aliphatic, and cyclic diisocyanates. Thermal stability depended on both the nature of the arylate block and its molecular weight. Using ethylene glycol to replace the phenolic -OH of the oligomers with an alcoholic -OH increased the thermal stability of the resulting copolymers by over 150°. Copolymers were also formed with alternating arylate and urethane blocks by reacting the oligoacrylates with both diisocyanates and glycols. Lengthening the glycol chain lowered the softening temperature of these copolymers. Those formed with aromatic diisocyanates showed significantly higher thermal stability, but this had little effect on thermal oxidative stability. Tables of thermal and mechanical properties of these copolymers and films made from them are given. Figures 2; references 4: 3 Russian, 1 Western.

[352-12672]

UDC 541(14+64):546.31

## SENSITIVITY OF PHENOLIC RESINS TO UV-IRRADIATION AND THEIR SOLUBILITY IN WEAK ALKALIS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 8, Aug 85  
(manuscript received 19 Jan 84) pp 1764-1767

KOLTSOV, Yu. I., KUZNETSOVA, N. P., SOLOMONENKO, G. V. and YUDINA, V. I.

[Abstract] Thin layers (up to 1000 nm) of commercial and experimental phenolformaldehyde resins and of poly-p-vinylphenol were prepared on quartz substrates and subjected to UV radiation under 350 nm wave length from a mercury-xenon lamp giving an approximate dosage of 10 mW/cm<sup>2</sup>. At 280 nm, the specific adsorption was relatively high for all samples, indicating significant absorption by surface and near-surface layers. At 255 nm, specific absorption was significantly lower, especially for novolac resins which are apparently rather transparent at this wavelength. Resol resins had lower solubility in alkali, but exposure to UV radiation

increased this solubility. This effect was attributed to photodegradation, as indicated by decreasing molecular mass after irradiation. A proposed site for this photodegradation was the methylene ester linkages in the resol resins. Novolac resins, on the other hand, lost solubility with increasing radiation doses; a corresponding gain in molecular weight indicated photopolymerization, probably due to the formation of phenoxy radicals. Similarly, the polyvinylphenol also showed a decrease in solubility, with photopolymerization probably depending on residual terminal vinyl groups. Absorption spectra also indicated a photoautomerization of benzene rings to cyclohexyldiene rings. Figures 3; references 7 (Russian).  
[352-12672]

UDC 541.64:536.7

#### METHOD FOR DETERMINING THERMODYNAMIC INCOMPATIBILITY OF POLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 30 Sep 83) pp 1371-1376

ROMANKEVICH, O. V., SUPRUN, N. P. and FRENKEL', S. Ya., Kiev Technologic Institute of Light Industry; Institute of High Molecular Weight Compounds, USSR Academy of Sciences, Moscow

[Abstract] A method has been proposed and tested for the assessment of thermodynamic incompatibility of polymers, which is based on the decomposition (into droplets) of a liquid cylinder of one polymer present in another polymer. Using standard mathematical approaches relating time factors, viscosity, and molecular weight, it is possible to analyze the wave of perturbation induced by such droplets in terms of time. In a thermodynamically compatible system the wave of perturbation is a linear factor in relation to  $\sqrt{t}$  ( $t$  = time). In thermodynamically incompatible systems over a wide molecular weight range, including  $M < M_{cr}$ , a linear  $\ln \alpha = f(\sqrt{t})$  relationship prevails, where  $\alpha$  is the amplitude of the wave of perturbation ( $\alpha = \alpha_0 \exp(q,t)$ , with  $q$  = coefficient of instability, and  $\alpha_0 = \alpha$  at  $t = 0$ ). Tabulated data are presented on studies conducted on a variety of polymer-polymer systems using this method and temperatures of 493-553°K to test for thermodynamic incompatibility. References 42: 23 Russian, 19 Western.  
[346-12172]

CHANGES IN LARGE PERIOD AND LONGITUDINAL DIMENSION OF HIGHLY-ORIENTED POLYETHYLENE ON ANNEALING

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 11 Nov 83) pp 1385-1389

CHVALUN, S. N., OZERIN, A. N., SELIKHOVA, V. I., ZUBOV, Yu. A. and BAKEYEV, N. F., Scientific Research Physical Chemical Institute imeni L. Ya. Karpov

[Abstract] Comparative studies were conducted on the large period and the longitudinal dimension of highly-oriented polyethylene, using samples with a large number of linear systems (25-fold multiplicity of extension) or virtually lacking such systems (7-fold extension). The large- and small-angle x-ray diffraction analysis in combination with differential scanning calorimetry provided quantitative data on the relationship between longitudinal ( $l_{002}$ ) and transverse ( $l_{110}$ ) dimensions of the crystallites, and of the large period ( $L$ ) and melting points on the annealing temperatures of both samples. The results were interpreted to indicate the presence of clusters of transitional macromolecules with the trans-configuration of the chains in the amorphous areas of highly-oriented polyethylene. Such straightened clusters, indicated by the predominance of  $l_{002}$  over  $L$ , serve as connector molecules between adjacent crystallites of polyethylene.

Figures 6; references 9: 5 Russian, 4 Western.

[346-12172]

RIGIDITY OF POLY-p-BENZAMIDE MOLECULES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 16 Nov 83) pp 1405-1410

POGODINA, N. V., BOGATOVA, I. N. and TSVETKOV, V. N., Scientific Research Institute of Physics at the Leningrad State University imeni A. A. Zhdanov

[Abstract] In order to determine the rigidity characteristics of 14 samples of poly-p-benzamide, double birefringence analysis was conducted on samples in sulfuric acid with modulation of elliptic polarized light. The data were analyzed on the basis of  $\Delta n/\Delta \tau$ , where  $\Delta n$  is the value of double birefringence, which provides a most sensitive indication of the conformational status of the poly-p-benzamide chain. A proportional increase in  $\Delta n/\Delta \tau$  with a four-fold increase in the MW of the polymer, which exceeds that observed for other polymers, indicates an equilibrium rigidity of poly-p-benzamide that exceeds that of other polymers. A calculated length of the Kuhn segment of  $650 + 50$  Å for poly-p-benzamide provided further confirmation for the greater rigidity. The greater rigidity of poly-p-benzamide

was ascribed to nonequivalence of the  $\alpha$  and  $\beta$  angles at the nitrogen and carbon atoms of the amide groups and to non-coplanarity of the amide group bonds. Figures 2; references 32: 17 Russian, 15 Western.  
[346-12172]

UDC 541.64:536.6

CALORIMETRIC STUDIES ON 1,6-HEXAMETHYLENEDIISOCYANATE, ITS POLYCYCLOTIMERIZATION, AND POLYCYCLOTRIMER AT 13.8-370°K

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 17 Nov 83) pp 1411-1416

LEBEDEV, B. V., BYKOVA, T. A., KIPARISOVA, Ye. G., PANKRATOV, V. A., FRENKEL', Ts. M. and KORSHAK, V. V., Scientific Research Institute of Chemistry at the Gorky State University imeni N. I. Lobachevskiy; Institute of Heteroorganic Compounds imeni A. N. Nesmeyanov, USSR Academy of Sciences

[Abstract] A combination of precision adiabatic and isothermal calorimetry and differential scanning microcalorimetry was employed to study the thermodynamic characteristics of 1,6-hexamethylenediisocyanate, its polycyclotrimerization, and of the polycyclotrimeric product in the temperature range of 13.8 to 370 °K. The resultant data are tabulated in relation to temperature and physical state, and include the following parameters:  $C_p^{\circ}$ ,  $H^{\circ}(T)-H^{\circ}(0)$ ,  $S^{\circ}(T)$  and  $-[G^{\circ}(T)-H^{\circ}(0)]$ . The thermodynamic data for the polycyclotrimerization encompassed determinations of  $\Delta H^{\circ}$ ,  $\Delta S^{\circ}$ , and  $\Delta G^{\circ}$ , with the free energy for trimerization ranging from -121 kJ/mole at 0°K to -88.4 kJ/mole at 370°K. Figures 1; references 17: 13 Russian, 4 Western.  
[346-12172]

UDC 541.64:536.4:547.322

THERMAL DESTRUCTION OF HOMO- AND COPOLYMERS OF VINYL CHLORIDE IN SOLUTION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 20 Nov 83) pp 1428-1433

MINSKER, K. S., ABDULLIN, M. I., GIZATULLIN, R. R. and ZAIKOV, G. Ye., Bashkir State University imeni 40th October Anniversary; Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] An assessment was made of the factors contributing to thermal destruction of vinyl chloride homo- and copolymers in a number of solvent systems at 423 and 448°K. Determinations of the rate of dehydrochlorination in relation to basicity, the dipole moment, dielectric constant and temperature demonstrated that destruction was predicated on solvation

effects. Specific solvation effects consisted of donor-accepted factors, while nonspecific effects involved van der Waals forces in the interactions of the solvent molecules with anomalous structures in polyvinyl chloride either decelerate or accelerate dehydrochlorination, depending on the basicity, with the formation of multiple conjugated C=C bonds. Nonspecific interactions accelerate degradation in all cases, regardless of the basicity. Figures 5; references 10: 8 Russian, 2 Western.  
[346-12172]

UDC 541.64:539.3

#### INCOMPLETE KINK BANDS IN HIGH DENSITY POLYETHYLENE WITH MAXIMUM ORIENTATION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 21 Nov 83) pp 1438-1445

PERTSEV, N. A., MARIKHIN, V. A., MYASNIKOVA, L. P. and PELTSBAUER, Z.,  
Physical Technical Institute imeni A. F. Ioffe, USSR Academy of Sciences

[Abstract] Scanning electron microscopy was employed in a study of incomplete kink bands in highly oriented high density polyethylene (HDPE) to evaluate the effects of kink formation on deformation and strength characteristics of the polymer. The advantage of incomplete kinks is that they are limited by fronts that generate further stresses in HDPE, whereas kinks that transverse the entire cross-section of a fiber represent static states. Micrographs and graphical schematic depictions demonstrate that the thickness of a kink band is smaller than the other dimensions of the kink and that, therefore, the front of an incomplete kink constitutes a macroscopic linear defect. The characteristics of the defect are determined by its orientation in relation to the kink vector, which is analogous to the Burgers vector for dislocations. The screw (or parallel or helical) front has a sharp profile that is cline-like and has an opening angle of ca. 8-10°. The boundary (or perpendicular) front has a different geometry, with the appearance of several discrete regions of reorientations before the major band that show a gradual decrease in prominence. The differences in the two profiles are due to differences in factors that determine the stress tensors of these fronts (i.e., dipoles of Somilian dislocations).  
Figures 7; references 21: 7 Russian, 14 Western.

[346-12172]

UDC 541.64;547(315.3+313.3+256.2)

LIGAND EFFECTS IN  $\text{LTiCl}_3\text{-Al}(\text{i-C}_4\text{H}_9)_3$  CATALYTIC SYSTEM ON ALTERNATING BUTADIENE-PROPYLENE COPOLYMERIZATION

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 23 Nov 83) pp 1452-1457

VENEDIKTOVA, N. A., SMIRNOVA, L. V. and KROPACHEVA, Ye. N., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] Studies were conducted on the importance and effects of the ligand (L) component on the catalytic system  $\text{LTiCl}_3\text{-Al}(\text{i-C}_4\text{H}_9)_3$  in promotion of alternating butadiene-propylene copolymerization. Comparative data were also obtained for the system catalyzed by the three-component  $\text{TiCl}_4\text{-acetophenone-Al}(\text{i-C}_4\text{H}_9)_3$  catalyst. Low activity of alkoxy derivatives of Ti was ascribed to an evident lower concentration of active sites in comparison with systems where L was represented by phenylcarboxy or acetoxy groups. Stabilization of the active sites in the case of methyl and phenylcarboxyl derivatives of Ti in the catalytic combination was apparently due to intra- and intermolecular interaction of the C=O group with the Ti atom. Addition of acetophenone resulted in complete inhibition of copolymerization in the case of a 3-fold excess of  $\text{Al}(\text{i-C}_4\text{H}_9)_3$ . Introduction of a second carboxyl group into the Ti compound enhances copolymerization only at  $\text{Al:Ti}$  ratio of 6 or better. The activities of the Ti compounds in promoting copolymerization ranked as follows in terms of butadiene utilization:  
 $\text{ROTiCl}_3 < \text{TiCl}_4 < \text{Cl}_3\text{COCOTiCl}_3 < \text{ROTiCl}_3 + \text{acetophenone} < \text{CH}_3\text{OCOTiCl}_3 < \text{C}_6\text{H}_5\text{OCOTiCl}_3$ .  
Figures 3; references 11: 5 Russian, 6 Western.

[346-12172]

UDC 541(127+64)

KINETICS OF BIMOLECULAR BREAKAGE OF KINETIC CHAINS IN POLYMERIZATION OF MONOMERS ADSORBED ON SOLID CARRIERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 24 Nov 83) pp 1458-1462

PAVLOV, S. A. and BRUK, M. A., Scientific Research Physical Chemical Institute imeni L. Ya. Karpov

[Abstract] Studies were conducted on the kinetics of bimolecular termination of chains of monomers undergoing polymerization when adsorbed on surfaces of solid support media, as a result of the recombination and disproportionation of the growing macroradicals. The mathematical treatment was based on the modern theory of diffusion kinetics of bimolecular reactions in the adsorbed state. The treatment was accorded to data obtained for the initial and postradiation kinetics of radiation-initiated polymerization of vinyl acetate adsorbed on methylated Aerosil. The analysis revealed that bimolecular termination on a solid support is not

analogous to termination occurring in liquid bulk, since the break on a solid surface proceeds with a time-dependent (decreasing) rate constant in the postradiation phase of the kinetic curve. In the radiation phase the rate constant of termination is dependent on the rate of initiation of polymerization. In the case of reaction on a nonplanar surface, e.g., spherical or cylindrical particles, the rate constant of chain termination can also be expected to be influenced by the size of the particles.

Figures 2; references 12: 8 Russian, 4 Western.  
[346-12172]

UDC 541.64:539.3

#### FISSURE PROPAGATION IN GLASSY POLYMERIC FILMS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 25 Nov 83) pp 1463-1467

BERLIN, Al. Al., GRINEVA, N. S., ALEKSANYAN, G. G. and SAFONOV, G. P.,  
Institute of Chemical Physics, USSR Academy of Sciences

[Abstract] The processes of plastic deformation and fissure propagation in films prepared from diphenylolpropane and equimolar mixtures of isophthalic and terephthalic acids were subjected to mathematical analysis. The studies were conducted with 20 mm long film strips that were either intact or subjected to a razor-blade nick. Analysis of the stretch-induced stress by polarization microscopy demonstrated that initially the applied stress induced a plastic deformation, which was followed by fissure growth or extension. The effective surface energy of film destruction was dependent on the thickness of the film in the 20 to 100  $\mu\text{m}$  range, but was largely independent of whether the sample had been nicked or not. The effective surface energy of destruction was proportional to the experimentally determined band of plasticity, indicating that progressive fissure growth in the film and the resultant increase in film stress are predicated on an increase in the size of the plasticity zone and the work of plastic deformation. Figures 3; references 5: 2 Russian, 3 Western.

[346-12172]

UDC 541.64:539.2

COMPUTER SIMULATION OF POLYMER CHAIN INTERACTION WITH ANISOTROPIC MATRIX

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 29 Nov 83) pp 1468-1474

KLYUSHNIK, B. N., MARCHENKO, G. N. and KHALATUR, P. G., Kalinin State University

[Abstract] The transition of flexible macromolecular chains from an isotropic medium into an anisotropic matrix invariably involves deformation of the macromolecular chains, a fact which is reflected in the free energy ( $\Delta F$ ) difference between these two states. The present study utilized the Monte Carlo computer simulation to provide the thermodynamic basis of such a transition, using polyethylene chains of variable length (N, where N = 10-201 carbon atoms). The anisotropic matrix was constructed to consist of rigid, infinitely long, rods. The rods, assigned a diameter of 3 Å, were separated by a distance  $h$  between the axes of the rods, where  $h = p^{-1/2}$  ( $p$  = number of rods per unit area in OXY plane). A general relationship,  $\Delta F \sim N(h^{-1.98})$ , was obtained, indicating that with a decrease in the value of  $h$ , i.e., with an increase in the density of the anisotropic matrix, the free energy increases sharply. A single curve was obtained when  $\Delta F/kT$  was plotted against  $h$  for different values of N, confirming the universality of this relationship. Excellent agreement was also obtained between this approach and previously published experimental data. Figures 5; references 20: 3 Russian, 17 Western.  
[346-12172]

UDC 541.64:539.199

CONFORMATIONAL ORDER IN NATURAL AND SYNTHETIC CIS-1,4-POLYISOPRENES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 29 Nov 83) pp 1475-1481

NELSON, K. V., BEREZKINA, A. P. and KURLYAND, S. K., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] Polarization IR spectroscopy was employed to analyze the conformational characteristics of natural and synthetic cis-1,4-polyisoprene rubber, in order to assess the response of such polymeric systems to an applied external force. The samples under study contained 99% cis-1,4-bonds, 0.5% trans-1,4-bonds, and 0.5% 3,4-bonds. Varying the degree of stretching from 0- to 8-fold at a rate of 50 mm/min at -25 or 20°C showed that both samples sustained an increase in crystallinity with an increase with stretching to a certain limit value. Thereafter, further stretching did not result in a further increase in crystallinity, with the degree of crystallinity remaining constant. These observations were interpreted to

indicate conformational rearrangement of the polymeric chains at a certain critical degree of stretching, designated  $\beta^*$ , which is equal to the ratio of the distance between the ends of the chain and the contour length of the molecule. At  $\beta < \beta^*$  the formation of crystals with a folded chain is thermodynamically favored, whereas with extention to  $\beta > \beta^*$  thermodynamic considerations favor crystals with extended chains. Thus, orientational crystallization in both the synthetic and natural cis-1,4-polyisoprenes can be described by crystalline topomorphism. Figures 3; references 11: 10 Russian, 1 Western.  
[346-12172]

UDC 541.64:539(2+3)

#### RELATIONSHIP BETWEEN DEFORMATION AND STRUCTURAL CHARACTERISTICS OF POLYMERIC LATTICEWORKS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 29 Nov 83) pp 1487-1491

FILYANOV, Ye. M., KRASNIKOVA, T. V. and PESCHANSKAYA, N. N., All-Union Scientific Research Institute of Synthetic Resins

[Abstract] Studies were conducted on temperature-related rates of deformation of two epoxy resins differing in the extent of cross-linkage. Resins ED-L (greater cross-linkage) and ED-D were derived from ED-16 resins subjected to treatment with different curing agents, and shared essentially similar  $T_g$  values despite differences in the degree of cross-linkage. Analysis of the rate, elasticity and activation parameters on compression ( $0.16 \text{ kg/mm}^2$ ) over a temperature range of -80 to +75°C ( $1^\circ/\text{min}$ ) demonstrated that the mobile phase of the molecular chain consisted of segments between branch points, the effective size of which is determined by the value of  $M_N$ . The number of structural units participating as a single mechanical segment in cooperative translation was about twice as great for ED-L as for ED-D. The greater drop in elasticity in ED-D on deformation, and its greater resistance to deformation over the entire temperature range, reflected greater mobility of the polymeric chains in ED-D. As a result of the greater mobility the structure of ED-D could assume a more compact form and, consequently, favor more extensive intermolecular interactions. The more compact nature of ED-D was also confirmed by water diffusion studies, for which a diffusion constant of  $6.8 \times 10^{-10} \text{ cm}^2/\text{sec}$  was calculated, as opposed to  $9 \times 10^{-10} \text{ cm}^2/\text{sec}$  for ED-L. Figures 3; references 16 (Russian).  
[346-12172]

UDC 541(64+183.12)

EFFECTS OF COUNTERIONS ON FORMATION AND CHARACTERISTICS OF  
NONSTOICHIOMETRIC POLYELECTROLYTE COMPLEXES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 2 Dec 83) pp 1496-1499

NEFEDOV, N. K., YERMAKOVA, T. G., KASAIKIN, V. A., ZEZIN, A. B. and  
LOPYREV, V. A., Irkutsk Institute of Organic Chemistry, Siberian Department,  
USSR Academy of Sciences; Moscow State University imeni M. V. Lomonosov

[Abstract] Turbidometric studies were conducted on the formation of non-stoichiometric complexes between poly-4-vinyl-N-ethylpyridinium fluoride (I) and sodium polyacrylate (II), to assess the effects of counterions. The complexes were formed by the slow addition of dilute II to I, i.e., complete mixing of the fully ionized compounds. The formation of nonstoichiometric complexes was obtained only in cases of low-level binding of counterions, whereas higher concentrations led to the appearance of insoluble stoichiometric complexes. The stability of the soluble nonstoichiometric complexes was largely determined by the nature of the I counterion, and not by the II counterion. Thus, soluble nonstoichiometric complexes were not formed by poly-4-vinyl-N-ethylpyridinium bromide. Figures 3; references 10: 6 Russian, 4 Western.

[346-12172]

UDC 541.64:542.944

EFFECT OF CHLORINATION ON CHEMICAL STRUCTURE OF POLYVINYL CHLORIDE

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 5 Dec 83) pp 1500-1505

LISITSKIY, V. V., KRASNOVA, T. P. and LEBEDEV, V. P., Bashkir State  
University imeni 40th October Anniversary

[Abstract] Solid and liquid phase ozonization was employed in a study on the effects of chlorination on the chemical structure of various samples of polyvinyl chloride (PVC). The PVC samples were chlorinated under different conditions to assure variable distribution of C=C bonds. Ozonization and subsequent oxidative hydrolysis with H<sub>2</sub>O<sub>2</sub> led to a decrease in viscosity to a limit value, with the time required to reach the limit value and the drop in viscosity increasing proportionately to the degree of chlorination. This relationship was interpreted to indicate that, concomitantly with chlorination, HCl was eliminated, leading to C=C bond formation in PVC. Despite destruction of the polymer, the total number of C=C bonds during chlorination remained relatively constant with chlorination approaching 70 wt%. The relative stability of the concentration of the C=C bonds was predicated on the counterbalance of a marked decrease in

terminal unsaturated groups by a compensatory increase in the number of internal C=C bonds. Chlorination, therefore, affected the distribution of C=C bonds in PVC and somewhat diminished their total concentration, but the method employed for chlorination had no effect on the final product. Figures 6; references 12: 7 Russian, 5 Western.  
[346-12172]

UDC 541.64:539.3

#### CHARACTERISTIC FEATURES OF SEGMENTS OF POLYMER DEFORMATION AND CREEP CURVES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 5 Dec 83) pp 1513-1517

PESCHANSKAYA, N. N., SINANI, A. B. and STEPANOV, V. A., Physical Technical Institute imeni A. F. Ioffe, USSR Academy of Sciences

[Abstract] Laser interferometry was used to study the initial portions of curves depicting deformation and creep of polymers to assess the relationship of such anomalies to the temperature-dependent spectrum of mechanical losses. The sensitivity of the apparatus made possible creep measurements with an accuracy of ca. 1% with  $0.005\% (3 \times 10^{-4} \text{ mm})$  compression-induced deformations. Measurements on polymethyl methacrylate, polyvinyl chloride, and epoxy resins (ED-20, UP-610) demonstrated that within viscoelastic deformation range areas of accelerated creep are detectable. The accelerated creep can be regarded as a manifestation of local plastic transitions that are analogous to forced elastic deformations. Consequently, a smooth deformation curve with a continuous change in the relaxation modulus can only be regarded as an acceptable approximation in view of the small sequelae of the localized creep. Nevertheless, these studies do demonstrate the presence of inflection points on the initial segments of the curves.

Figures 2; references 12 (Russian).

[346-12172]

UDC 541(64+15)

#### RADIOLYSIS OF POLYMETHYL METHACRYLATE AND POLYMETHYL ACRYLATE ON SOLID SUPPORT

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 6 Dec 83) pp 1518-1523

BRUK, M. A., ISAYEVA, G. G., YUNITSKAYA, Ye. Ya., PAVLOV, S. A. and ABKIN, A. D. (deceased), Scientific Research Physical Chemical Institute imeni L. Ya. Karpov

[Abstract] A comparative study was conducted on radiolysis of polymethyl methacrylate (PMMA) in solution and when adsorbed on  $\text{SiO}_2$  (Aerosil A-175),

which demonstrated that adsorbed PMMA films were especially susceptible to radiolysis. Gamma radiation-induced radiolysis was more effective with higher MW PMMA, i.e., there was an inverse relationship between the dose required for radiolysis in the 0.5 to 50.0 kGy range (0.35 Gy/sec) and the MW at 20°C. One of the primary factors increasing the efficiency of gamma radiation appears to be effective energy transfer by SiO<sub>2</sub> of energy to the surface and the consequent high yield of surface active sites which are involved in radiolysis. Studies with polymethyl acrylate (PMA) demonstrated that doses of 1-1.5 kGy in solution led to cross-linkage and gel formation, whereas radiation doses 10-50-fold greater were required for a similar effect with PMA adsorbed to SiO<sub>2</sub>. Lower doses with adsorbed PMA resulted in radiolysis. Such observations have relevance to polymerizations conducted on solid surfaces, as well as to analysis of radioresistance of polymer coatings. Figures 4; references 10: 7 Russian, 3 Western.  
[346-12172]

UDC 541.64:543.422.27

#### SPIN-PROBE DIAGNOSIS OF LOCAL ELECTRICAL FIELDS IN POLYMERS

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 7, Jul 85  
(manuscript received 23 Jul 84) pp 1549-1551

KERIMOV, M. K., SULEYMANOV, B. A., MANSIMOV, S. A. and GEZALOV, Kh. B., Radiation Research Section, Azerbaijan SSR Academy of Sciences

[Abstract] Exposure of polyethylene films to strong electric fields on the order of 10<sup>6</sup> V/cm was seen to result in an increase in the A<sub>0</sub>, constant of superfine splitting on ESR spectra, using a TEMPO probe introduced into the film. In a few cases the increase in A<sub>0</sub> approached the value of 1 Gauss after 15-20 min of exposure to the electric field. After switch off, the value of A<sub>0</sub> gradually returned to baseline. The increase in A<sub>0</sub> was demonstrated to arise as a result of formation of local electric fields in the polymer which, judging from the shift in A<sub>0</sub>, approached 3 x 10<sup>7</sup> V/cm. These observations indicate that spin-probes may be useful in studies on in-bulk charges and related electric fields in dielectric polymers. Figures 1; references 11: 8 Russian, 3 Western.  
[346-12172]

UDC: 541.64:547.538.141

POLYMERIZATION OF STYRENE FILLED WITH CALCIUM CARBONATE

Ivanovo IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: KHIMIYA I KHMICHESKAYA TEKHOLOGIYA in Russian Vol 28, No 7, 1985 (manuscript received 21 Dec 83) pp 80-83

PRAVEDNIKOV, A. N., IVANOV, A. A., ROMANOVICH, Yu. K. and TYULYUKINA, O. V., Department of Polymer Synthesis, Moscow Institute of Precision Chemical Technology imeni M. V. Lomonosov

[Abstract] A study is presented of the specifics of block polymerization of styrene filled with calcium carbonate, with and without a polymerizable modifier. When azoisobutyric acid dinitrile (AID) was used as the initiator, the rate of polymerization of styrene filled with nonmodified  $\text{CaCO}_3$  was lower than when the filler was absent. When benzoyl peroxide was used the initial reaction rate increased somewhat in comparison to the unfilled system. The specifics of block polymerization of the highly filled styrene were found to result primarily from the fact that a significant fraction of the reaction zones was in an area close to the surface of the filler. Figures 2; references 7: 6 Russian, 1 Western.

[368-6508]

RADIATION CHEMISTRY

UDC 541.135.4

ISOTOPIC EFFECT AND MECHANISM OF ELECTRICAL CONDUCTION IN CsHSO<sub>4</sub>

Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR: SERIYA  
KHIMICHESKIYE NAUKI in Russian Vol 11, No 4, Jul 85  
(manuscript received 20 Jul 84) pp 99-105

KHAYNOVSKIY, N. G., PAVLYUKHIN, Yu. T. and KHAYRETDINOV, E. F.,  
Institute of Solid-State Chemistry and Mineral Raw Materials Processing,  
Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] An experimental study of CsHSO<sub>4</sub> and CsDSO<sub>4</sub> crystals was made for determining their electrical conductivity over the 493-293 K temperature range and the 5 Hz - 0.5 MHz frequency range. Single crystals of both varieties, the latter with at least 95% conversion to deuterium, were grown by isothermal evaporation from aqueous solutions. Hydrogen being the lightest element and having high ion vibration frequencies contributes to a high polarizability of a proton and to the possibility of proton transport by the tunneling mechanism, which limits the ion mobility, but also to a proton energy spectrum which is not necessarily continuous. The electrical conductivity was found to increase with rising temperature, but not according to Arrhenius' law, in the low-temperature range. An analysis of the frequency dependence on several conductivity isotherms, for separating the mobility component from the concentration component of electrical conductivity, has revealed a not-yet-understood temperature dependence of the tunneling probability and thus also of the proton mobility. The temperature dependence of electrical conductivity in the high-temperature range was found to follow the Arrhenius law, with a proton activation energy of 0.32 eV and a deuterium activation energy of 0.27 eV. Assuming a potential barrier formed by two parabolic wells, transition of CsHSO<sub>4</sub> from its low-temperature phase II (414-260 K) to its high-temperature phase I (483-414 K) is evidently accompanied by a restructurization which drops the peak of the potential barrier below the first activation level. Figures 4; references 27:  
10 Russian, 17 Western (3 in Russian translation).  
[377-2415]

RUBBER AND ELASTOMERS

UDC 541.64:547(315.2+313.3)

STUDY OF COPOLYMERIZATION OF BUTADIENE AND PROPYLENE UNDER INFLUENCE OF INDIVIDUAL  $Ti^{+3}$  COMPOUNDS AND THEIR COMPLEXES

Moscow VYSOKOMOLEKULYARNYYE SOYEDINENIYA in Russian Vol 27, No 8, Aug 85  
(manuscript received 27 Dec 83) pp 1676-1680

SMIRNOVA, L. V., VENEDIKTOVA, N. A. and KROPACHEVA, Ye. N., All-Union Scientific Research Institute of Synthetic Rubber imeni S. V. Lebedev

[Abstract] The catalytic activity of tribenzyltitanium, tris-(-oligo-butylidienyl)titanium, and their mono- and dichloro- derivatives is assessed. Neither of the basic compounds catalyzed copolymerization of butadiene and propylene, but both of them and their monochloro- derivatives catalyzed polymerization of butadiene out of the mixture, with variations in yields and in the types of bonds formed. The addition of various electron acceptors to the mono- and dichloro- derivatives did produce copolymers at varying temperatures and reaction times. With  $(CH_3)_3SiCH_2TiCl_3$ , most of the propylene was in block sequences. With isobutylaluminum chloride and diisobutylaluminum chloride, almost all the propylene units alternated with butadiene units. Intermediate results were achieved with diethylaluminum chloride. Variations in the types of bonds formed were also noted. Figures 1; references 11: 8 Russian, 3 Western.

[352-12672]

UDC 678.031:615.4

PRODUCTION OF MEDICAL ARTICLES FROM LATEX

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 6-9

EL'KINA, I. A., LARINA, L. N., ANTONOVA, L. N. and VODOVOZOVA, N. Ye.

[Abstract] A formulation has been devised for the production of bio-compatible latex articles intended for medical use (gloves, catheters, bottle nipples, etc.), which offers latex capable of withstanding multiple sterilizations and quite durable. On a mass number basis, optimal mixing

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[352-12672]

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[Abstract] A formulation has been devised for the production of bio-compatible latex articles intended for medical use (gloves, catheters, bottle nipples, etc.), which offers latex capable of withstanding multiple sterilizations and quite durable. On a mass number basis, optimal mixing

formulation was determined as 100.0 natural centrifuged latex, 2.0-3.0 thiuram D, 1.0 thiourea, 0.6-1.0 zinc oxide, 0.5 sulfur, and 1.0 zinc diethyldithiocarbamate. With appropriate washing sufficient chemicals were eliminated to render the products safe for routine use. In addition, for lubrication the recommended treatment calls for a 0.03% active chlorine solution rather than vaseline (which causes deterioration). Figures 5; references 4 (Russian).

[3-12172]

UDC 678.4.049.614.4

#### NOVEL SOFTENING AGENT FOR RUBBER USED IN MEDICAL ARTICLES AND FOOD CONTAINERS

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 11-13

YAROVIKOVA, M. M., ORLOVA, L. P. and GURVICH, Ya. A.

[Abstract] A novel oil softening agent has been designed for use in rubber intended for the fabrication of medical articles and food containers -- designated netoksol [sic] -- and intended as a replacement for oil I-8A which is currently in use. Netoksol is a stable substance lacking heavy aromatic hydrocarbons and has a high flash point (170°C) due to a low content of volatile substances. Animal studies have shown that it has low toxicity and weak cumulative properties; it is virtually lacking in benz[ $\alpha$ ]pyrine. Comparative studies with netoksol and I-8A in natural rubber have shown virtually identical effects on mechanical properties, resulting in plans for mass production of netoksol. Figures 2.

[3-12172]

UDC 678.664.074:539.412.1

#### EFFECT OF CROSSLINKAGE IN SEGMENTED POLYURETHANES ON STRENGTH AND HYSTERESIS

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 24-26

SEMENOVA, Ye. P., SOTNIKOVA, E. N., TKACHENKO, G. T. and VIKULINA, M. N.

[Abstract] An evaluation was made of crosslinkage characteristics in segmented polyurethanes on the modulus of elasticity, hysteresis and energy content. The polymers were synthesized from 1:5:4 molar mixture of polyethylenebutylene adipinate, 2,4-toluylenediisocyanate (TDI) and 1,4-butanediol. In some polyurethane samples crosslinkage was affected by addition of the organic peroxide Peroximon F-40 and TDI dimer. Stretch studies at 20-70°C at a rate of 100 mm/min demonstrated that in the absence

of crosslinking agents the tensile strength of the polyurethanes was less than 25 MPa, increasing to a maximum of 46.5 MPa on addition of TDI dimer and F-40. Introduction of both thermolabile and thermostable C-C bonds in the presence of optimal concentrations of aromatic crosslinking agents increased the energy content from 2.2 to 7.65 J, and increased the modulus of elasticity on 100% stretching. Figures 2; references 6: 1 Russian, 5 Western.

[3-12172]

UDC 678.684.82.9.404:543.544

#### CHANGES IN MW PARAMETERS IN COURSE OF POLYSULFIDE OLIGOMER SYNTHESIS

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 29-31

GRUNKINA, A. D., NASONOVA, T. P., VALUYEV, V. I. and TORMOZOVA, T. V.

[Abstract] Gel permeation chromatography (GPC) was employed for an analysis of polysulfide oligomer synthesis, consisting of condensation of di-(beta-chloroethyl)methylal dithiosulfate with sodium sulfide in the presence of sodium hydrosulfide. The elution fractions were found to contain three major peaks, with the first peak (I) representing the polysulfide oligomer, peak II consisting of individual cyclic compounds, and peak III consisting of monomers linked by disulfide bonds. The elution pattern depicted the gradual oligomerization against a time scale. The  $\bar{M}_n$  vs. time relationship for the polymeric component was quite similar to that for the  $\bar{M}_w$  vs. time relationship, as a result of which there was no pronounced change in the  $\bar{M}_w/\bar{M}_n$  ratio. However,  $\bar{M}_n$  of the polymeric system increases with time and  $\bar{M}_w/\bar{M}_n$  ratio of the system decreases about two-fold toward the end of the synthetic process. These observations indicate that polydispersity of the polymeric system is the most sensitive indicator of the progress of polysulfide oligomer synthesis. Figures 3; references 7: 3 Russian, 4 Western.

[3-12172]

UDC 678.664.074.620.197.6

#### PROTECTIVE COATINGS FROM POLYESTER URETHANE PREPOLYMERS

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 38-40

SAYRANOVA, A. A., LABUTIN, A. L. and KHASANOV, M. Kh.

[Abstract] Tabular data are presented on the physical characteristics and chemical resistance of four polyester urethane prepolymers designed for use as protective coating materials. Applied with a brush to a surface, all four compounds formed highly elastic, pore-free films within

an hour at 20°C that hardened in 13-15 h. On the basis of overall characteristics the following two formulations were deemed to possess superior properties: P-6 (adipic acid + ethylene glycol + 2,4-TDI) and P-6-BA (adipic acid + ethylene glycol + 1,4-butyleneglycol + 2,4-TDI). In addition, formulation PDEA-800 (adipic acid + diethyleneglycol + 4,4-diphenylmethanediisocyanate (modified by special catalyst at 180-220°C)) formed films with high wear resistance and stability on exposure to water and mineral acid and salt solutions. References 10 (Russian).  
[3-12172]

UDC 678.7:66.094.36+678.742.5(04)

#### CHARACTERISTICS OF EPOXIDATED TRANS-PENTENE OLIGOMERS

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 44-45

SOLOV'YEVA, M. G., POPOVA, V. V., KOSHEL', N. A. and TUROV, B. S.

[Abstract] Determinations were made of the physical characteristics of trans-pentene oligomers (TPO) subjected to epoxidation, since introduction of epoxy groups increases the reactivity of liquid rubbers. TPO was synthesized by the reaction of open-ring cyclopentene with epichlorohydrin, with the polymer subsequently epoxidated with tertbutyl hydroperoxide at 100°C to introduce 5 to 20 wt% epoxy groups. The MW of epoxidated TPO increased proportionally to the number of introduced epoxy groups, with oligomers containing 5 wt% or more epoxy groups having the properties of highly viscous fluids. Viscosity studies of the TPO (85% trans bonds, 6.5% cis bonds, 2.9% end vinyl groups) over the temperature range of 20-50°C yielded an energy of activation vs. epoxy group content curve that was linear, indicating a Newtonian fluid. Extrapolation to zero epoxy group concentration yielded an activation value of ca. 21 kJ/mole. Polydispersity remained relatively constant with different degrees of epoxidation ( $\bar{M}_w/\bar{M}_n = 1.8-2.2$ ), indicating that epoxidation of TPO did not result in structure formation. Figures 2; references 6 (Russian).

[3-12172]

USE OF ATACTIC POLYPROPYLENE IN INDUSTRIAL RUBBER PRODUCTS

Moscow KAUCHUK I REZINA in Russian No 7, 1985 pp 45-47

URAL'SKIY, M. L., MEYLAKHS, L. A., GORELIK, R. A. and SEN'KO, M. Yu

[Abstract] Trials were conducted on the effects of atactic polypropylene (APP) on the properties of neoprene (Nairit; KR-50) and synthetic SKMS-30RP rubber, to determine whether APP can be used as a substitute for stereospecific polypropylene for reasons of economy. Determinations of plasticity, viscosity, thermoplasticity, fabricability, and so forth, demonstrated that while APP reduces the effective viscosity, plasticity is virtually unaffected and thermoplasticity increases. Fabricability of SKMS-30RP was virtually unaffected, while that of neoprene rubber showed a marked increase; in addition, adhesiveness of the former products increased, while that of the latter decreased. Optimal concentrations of APP for the preparation of industrial rubber products were found to fall in the 5-10% range, which elicited a reduction in the values of standard physical mechanical parameters of 3-12%. Figures 2; references 4: 3 Russian, 1 Western.

[3-12172]

WATER TREATMENT

UDC 628.35

USE OF INDUSTRIAL OXYGEN FOR INTENSIFICATION OF PROCESS OF BIOCHEMICAL PURIFICATION OF PETROCHEMICAL INDUSTRY WASTE WATERS

Baku AZERBAYDZHANSKOYE NEFTYANOYE KHOZYAYSTVO in Russian No 7, Jul 85  
pp 54-57

GASANOV, A. G., AMIROVA, S. M., RUKAVISHNIKOVA, L. A., KIRILLOVA, L. M.  
and KURBANOVA, F. A., Baku Branch of All-Union Scientific Research Institute  
of Water Supply, Sewerage, Hydrotechnological Equipment and Hydrogeological  
Engineering

[Abstract] Using oxygen instead of air increases the concentration of active sludge and avoids the formation of stagnant zones. It can be simply substituted in the normal aeration process. Waste waters of the Sumgait industrial complex, mixed 2:1 with domestic sewage, were treated in a closed oxidation tank with active sludge from the local treatment plant. An oxidative capacity of 4.64 kg/m<sup>3</sup>/day was attained with 8 g/l of sludge and 3 h aeration, maintaining an oxygen concentration of 12-15 mg/l. Under these conditions, biological oxygen demand dropped from 400-600 to 18-20 mg/l, and chemical oxygen demand from 620-1025 to 150-200 mg/l. Figures 3; references 4: 3 Russian, 1 Western.

[378-12672]

UDC 541.183+628

ADSORPTION TREATMENT OF CHEMICAL PLANT WASTE WATERS FOR ELIMINATION OF ORGANIC POLLUTANTS

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 7 Jul 83) pp 22-25

KANAVETS, R. P., GORA, L. N. and LEVCHENKO, T. M., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] An adsorption technique was developed for the treatment of waste waters from a chemical plant, the essential feature of which consisted of

percolation through an activated charcoal filter. Using a 3 m high filter filled with AG-3 activated charcoal, a flow rate of 2 m/h, and a contact time of 20 min led to the reduction of an initial BOD of 60-680 mg O<sub>2</sub>/liter to 40 mg O<sub>2</sub>/liter. In terms of BOD, the adsorptive capacity of AG-3 was calculated at 40 BOD units/g, and the consumption of AG-3 at 25 g/g BOD (or 3-4 kg of AG-3 per 1 m<sup>3</sup> of waste water). Oxidation of adsorbed organic matter was facilitated by Fe<sub>2</sub>O<sub>3</sub> at 250-260°C, resulting in virtually complete regeneration of the activated charcoal with loss of only 4-6% of the AG-3. Figures 4; references 4 (Russian).

[338-12172]

UDC 628.543.2:543

#### GAS CHROMATOGRAPHIC ANALYSIS OF ORGANIC PRODUCTS IN WASTE WATERS FROM GASEOUS AND LIQUID BLEACHING OF CELLULOSE SULFATE

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 31 May 83) pp 25-26

ZAPLATIN, V. P., KAL'CHENKO, O. I. and VIKHNINA, V. O., Ukrainian Scientific Production Association of the Paper Industry, Kiev

[Abstract] Comparative studies were conducted on the organic matter in waste water from gaseous and liquid (aqueous) chlorination processes of cellulose sulfate bleaching. Gaseous chlorination of cellulose sulfate yielded waste waters in which aliphatic monocarboxylic acids predominated as the organic component. Chlorination of cellulose sulfate in water yielded effluents with lower fatty acids and aromatic compounds, with the latter predominating. The gaseous process was thus demonstrated to be a safer process for the bleaching of cellulose sulfate on an industrial scale, in that it produced less toxic pollutants. References 5: 3 Russian, 2 Western.

[338-12172]

UDC 862.43

#### PHYSICOCHEMICAL FOUNDATIONS OF ALUMINUM COAGULANT PRODUCTION

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 8 Jun 83) pp 27-30

LAYNER, Yu. A., GUNDZILOVICH, L. V. and REZNICHENKO, V. A., Institute of Metallurgy imeni A. A. Baykov, USSR Academy of Sciences, Moscow

[Abstract] In view of the increasing need for aluminum sulfate and other coagulants, extensive studies have been undertaken on the physicochemical principles underlying the various industrial processes involved in the

production of this chemical and its use. The scope of studies included an evaluation of the aluminum ores in terms of reactivity with sulfuric acid, and the behavior of aluminum sulfate solutions in  $\text{Na}_2\text{SO}_4$ - $\text{K}_2\text{SO}_4$ - $\text{Al}_2(\text{SO}_4)_3$ - $\text{H}_2\text{O}$  systems, as well as the separation of liquid and solid phases. The degree of ore decomposition by mineral acids was evaluated from the energy values of crystalline lattices and thermodynamic potentials for mineral-solvent systems. Such analyses revealed that minerals showing best solubility in acids are biotite, callophyllite and nepheline (extensively used in the USSR as Al source). In addition, these studies have shown that the USSR possesses the mineral resources for a serious expansion of aluminum sulfate production. Figures 2; references 8: 7 Russian, 1 Western.

[338-12172]

UDC 628.387:621.182.12

EFFECTS OF  $\text{Ca}^{2+}$  AND  $\text{Mg}^{2+}$  IMPURITIES IN  $\text{NaCl}$  SOLUTIONS ON EFFECTIVENESS OF  
Na-ION EXCHANGE FILTER REGENERATION USED IN NATURAL AND WASTE WATER  
SOFTENING AND DEAMMONIATION

Kiev KHIMIYA I TEKHNOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 17 Jun 83) pp 30-32

POLETAYEV, L. N., SOBOL', A. S. and MALAKHOVA, I. A., Azerbaijan Institute of Petroleum and Chemistry imeni M. Azizbekov, Baku; Institute of Geochemistry and Analytical Chemistry imeni V. I. Vernadskiy, USSR Academy of Sciences, Moscow

[Abstract] A computer-based analysis was conducted on the effects of  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  impurities in  $\text{NaCl}$  solutions on the regeneration of KU-2 ion exchange membrane, used for softening and deammoniation purposes. Using mathematical models of ion exchange dynamics, the resultant data demonstrated that, when present in concentrations of ca. 15-20 mg-equiv/kg,  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$  reduced the filtration cycle by 1.4% and had only a minimal effect on the quality of the filtrate in terms of hardness. In effect, then, the presence of calcium and magnesium ion impurities at the levels specified had no tangible effects on the function of the KU-2 membrane. Figures 2; references 5 (Russian).

[338-12172]

UDC 621.359.7

DIFFUSION AND OSMOTIC PERMEABILITY OF MA-40 AND MK-40 HETEROGENOUS ION EXCHANGE MEMBRANES

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 22 Dec 83) pp 32-35

VEYSOV, B. K. and GREBENYUK, V. D., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Determinations were made of the diffusion and osmotic constants of the heterogenous ion exchange membranes MA-40 and MK-40 for the following electrolytes: NaOH, NaCl, LiCl, HCl, NaHCO<sub>3</sub>, CaCl<sub>2</sub>, MgCl<sub>2</sub>, Na<sub>2</sub>SO<sub>4</sub>, and Na<sub>2</sub>CO<sub>3</sub>. In the case of both membranes the diffusion constant was found to increase with an increase in the electrolyte in the external compartment -- with the exception of Na<sub>2</sub>SO<sub>4</sub> and Na<sub>2</sub>CO<sub>3</sub> in the case of MK-40. However, in the case of the osmotic permeability constants an inverse relationship prevailed between the external concentration and the value of the constant. Assessment of the tabulated data show that permeability was more affected by the mobility of the co-ion than by the counter-ion. Figures 3; references 6 (Russian).

[338-12172]

UDC 66.062/722/8:66.087.97

ELECTRICAL CONDUCTIVITY OF ION EXCHANGE MEMBRANES IN WATER-DIETHYLENE GLYCOL-SODIUM CHLORIDE SYSTEM

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 22 May 84) pp 35-38

IVASHCHENKO, V. F. and GREBENYUK, V. D., State Scientific Research and Engineering Institute of the Southern Scientific Research Institute of 'Giprogas', Donetsk; Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] In order to determine the effects of diethylene glycol (DEG) on the efficiency of ion exchange membranes used in water treatment, a study was made of the electrical conductivity of the anion exchange membrane MA-40 and the cation exchange membrane MK-40 in a water-DEG-NaCl system. The results were collated and presented in tabular form, and indicated that specific electrical conductivity and swelling of the membranes decreased with an increase in the concentration of DEG, and with a decrease in the concentration of NaCl in an equilibrium solution. The electrical conductivity increased in direct proportion to the temperature, and the relationship followed the Arrhenius equation. For MK-40 the energies of activation for electrical conductivity ranged from 35.2 to 58.1 kJ, depending on the test solution, and for MA-40 from 29.3 to 56.8 kJ. Figures 3; references 6 (Russian).

[338-12172]

UDC 628.162.84

EFFECTS OF WATER TREATMENT TECHNOLOGY ON GENERATION OF VOLATILE HALOGENATED ORGANICS

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 30 Aug 83) pp 39-45

MARCHENKO, Yu. G. and GONTAR', Yu. V., Ukrainian State Planning and Scientific Research Institute of Urban Community Constructions, Kharkov

[Abstract] A review is presented on the various factors involved in the treatment of natural and waste waters in relation to the effect of such technologies on the generation of volatile organohalogen compounds. The data contained in the literature demonstrate that in many cases altering the time of chlorination can have a beneficial effect in minimizing the formation of such compounds, as well as alterations in the manner of ozonization, coagulation, and flocculation or adsorption. Studies conducted with selected compounds, such as carbon tetrachloride, tetrachloroethylene, chloroform, bromodichloromethane, dibromochloromethane, and bromoform have shown that in many cases failure was due to lack of appreciation of the need to individualize treatment procedures. Although the use of activated charcoal is often disparaged because of high cost, the advantages that it offers should not be overlooked. Activated charcoal is an adsorbent that eliminates both organic and inorganic pollutants and, in addition, can remove 60-70% of residual chlorine as an added bonus. Figures 4; references 42: 1 Polish, 2 Russian, 39 Western.

[338-12172]

UDC 628.35

USE OF CHEMICAL MUTAGENS IN IMPROVING EFFICIENCY OF BIOLOGICAL WASTE WATER TREATMENT

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 17 Jan 83) pp 68-71

LEONOVA, J. Ye., ABRAMOV, A. V. and KARPUKHIN, V. F., All-Union Scientific Research Institute of Antibiotics, Moscow

[Abstract] A trial was conducted with the use of chemical mutagens in improving the oxidation potential of microorganisms in activated sludge, and hence improving the efficiency of biological water treatment. Selected samples of sludge were exposed to different concentrations (0.1 or 1%) of nitrosoethylurea for 4-6 h, and tested for effectiveness when added in concentrations of 0.0014 to 20% to bulk sludge in aerotanks in terms of changes in chemical and biological oxygen demand. Analysis of changes in oxygen demand demonstrated that chemical mutagenesis was effective, under the conditions specified, in markedly improving the

efficiency of biological sewage treatment. The effects were particularly noteworthy and long lasting with repeated treatment of sludge aliquots with the mutagen. Thus, sludge treatment with mutagens led to the selection of microorganisms with greater oxidative potential for biodegradable organics. Figures 4; references 6 (Russian).  
[338-12172]

UDC 579.6:695

#### MORPHOLINE DEGRADATION BY IMMOBILIZED BACTERIA

Kiev KHIMIYA I TEKHNOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 12 Jan 84) pp 71-73

DMITRENKO, G. N., UDOD, V. M. and GVOZDYAK, P. I., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, Ukrainian SSR Academy of Sciences, Kiev

[Abstract] Various genera of gram positive bacteria were grown in the presence of 2 g/liter of morpholine to favor selection of morpholine-degrading strains, and subsequently tested for their efficiency in degrading this xenobiotic. In liquid cultures, approximately 5 days were required for complete degradation of 500 mg/liter of morpholine. However, complete biodegradation was obtained in 24 h when the bacteria were immobilized on basalt fibers. Among the active genera were Bacillus, Arthrobacter, Micrococcus and Streptomyces. Arthrobacter utilized morpholine as the sole source of carbon, whereas Bacillus, Micrococcus and Streptomyces required supplementation with sucrose or ethanol. Figures 1; references 10: 8 Russian, 2 Western.  
[338-12172]

UDC 628.35

#### BIOCHEMICAL TREATMENT OF CHROMIUM-CONTAINING WASTE WATERS DURING OXIDATION OF COMPLEX ORGANICS

Kiev KHIMIYA I TEKHNOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 31 Jan 84) pp 73-76

ZHUKOV, I. M., SERPOKRYLOV, N. S., TOKAREVA, L. L. and KOSTYUKOV, V. P., Novocherkassk Polytechnic Institute

[Abstract] Thermodynamic calculations were conducted to determine the feasibility of coupling reduction of C(VI) to Cr(III) with biooxidation of complex organic compounds, to determine the efficiency of biological water treatment at plants producing chromium-polluted effluent. Studies

with chromates and bichromates showed that such an approach resulted in the elimination of chromium as  $\text{Cr}(\text{OH})_3$ : for example, oxidation of 1 mole of n-pentane required 5.8 moles of  $\text{CrO}_4^{2-}$ , and resulted in the production of 0.7 moles of cellular substance and 5.8 moles of Cr(III), with  $\Delta G^\circ = -26.58 \text{ kJ/mole}$  for the oxidative process. Studies with a number of petrochemicals demonstrated a concomitant reduction in petroleum hydrocarbons and in the concentration of Cr(VI), showing the biochemical water-treatment can be an effective means of treating chromium-contaminated water.  
Figures 2; references 6: 5 Russian, 1 Western.  
[338-12172]

UDC 541.183:628.16

#### WATER DEFLUORIDATION WITH ACTIVATED ALUMINUM OXIDE A-1

Kiev KHIMIYA I TEKHOLOGIYA VODY in Russian Vol 7, No 3, May-Jun 85  
(manuscript received 2 Nov 83) pp 87-88

BERENDEYEVA, V. L., VAKHNIN, I. G. and CORONOVSKIY, I. T., Institute of Colloid Chemistry and Water Chemistry imeni A. V. Dumanskiy, UkrSSR Academy of Sciences, Kiev

[Abstract] A column approach was used to define the factors affecting the efficiency of aluminum oxide A-1 columns in defluoridation of drinking water. The data showed that the adsorptive capacity of A-1 for the bicarbonate ion was greater than for  $\text{F}^-$  and that, therefore, the bicarbonate ion interfered with the elimination of  $\text{F}^-$ . In order to increase the efficiency and adsorptivity for  $\text{F}^-$ , the water pH should be adjusted to 4-5. In model systems with NaF in distilled water the adsorptive capacity for  $\text{F}^-$  was determined as  $3800 \text{ g/m}^3$  of A-1, and for tap water containing the bicarbonate ion the adsorptivity was calculated as  $900 \text{ g/m}^3$  of A-1.

Figures 1; references 5 (Russian).  
[338-12172]

MISCELLANEOUS

UDC 541.44

PLASMOCHEMICAL TWO-REACTOR FACILITY FOR STUDY OF INTERACTIVE REACTIONS  
BETWEEN ATOMIC HYDROGEN AND SOLID SUBSTANCES ON BASIS OF HIGH-FREQUENCY  
CAPACITIVE DISCHARGE WITH EXTERNAL ELECTRODES

Novosibirsk IZVESTIYA SIBIRSKOGO OTDELENIYA AKADEMII NAUK SSSR: SERIYA  
KHIMICHESKIYE NAUKI in Russian Vol 11, No 4, Jul 85  
(manuscript received 26 Mar 84) pp 105-112

SHISHKIN, Yu. A., KORIN, N. Ye., ZAYKO, N. N. and YAGZHEV, V. V.,  
Institute of Solid-State Chemistry and Mineral Raw Materials Processing,  
Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] Multiple-discharge plasmatrons as plasmochemical facilities with reactors operating sequentially in the gas loop are considered for two major applications, namely, for realizing pseudo-transport reactions in a stream of gas-discharge plasma such as synthesis or decomposition of volatile hydrides and for prepurification of gases such as molecular hydrogen by removal of the impurities ( $N_2, O_2$ ) after their conversion into trappable compounds ( $NH_3, H_2O$ ). A facility of this kind and a method of experimental study with it are proposed for the specific purpose of analyzing the interactive reactions between hydrogen and solid substances, particularly formation of thermally-unstable ovlatile hydrides of elements in groups III-VI:  $A_{solid} + H \rightarrow Me_n H_m$ . The facility contains two channels of high-frequency capacitive discharge with external electrodes. One channel will be used for purging  $N_2$  by converting into  $NH_3$  in the hydrogen discharge plasma and freezing  $NH_3$  in a trap with liquid nitrogen. The other channel will be used for atomization of  $H_2$  molecules. The facility requires a multireactor source of atomic hydrogen, two tubes with two electrodes having been found to be most expedient and only water (liquid) cooling being adequate so as to rule out air (gas) cooling. Accordingly, the facility includes two plasmichemical reactors in series with necessary pumps as well as pressure and temperature measuring instruments. The experiment begins after pre-evacuation and purge to remove residual adsorbed gases. Preliminary experiments have revealed a problem, namely that reduction of the quartz wall of the discharge tube by atomic hydrogen to  $SiO$  and then to  $Si$  destabilizes the  $H$  generating process, inasmuch as hydrogen atoms recombine into molecules much faster on  $SiO$  and  $Si$  surfaces than on  $SiO_2$  surfaces. This effect can be mitigated by metallization of the quartz

surfaces and monitoring the thickness of the metal coating before, as well as after, every lengthy experiment. It is also necessary to monitor the NH<sub>3</sub> concentration, to ensure an adequately pure molecular hydrogen. The prototype facility has already been used for studying the synthesis of several volatile hydrides of solid elements. Figures 1; references 51: 44 Russian, 1 Polish (in Russian translation), 6 Western (3 in Russian translation).

[377-2415]

UDC 541.49+539.1.12.43

#### PROTON NMR STUDIES ON ACRIDINE ORANGE AGGREGATION

Novosibirsk ZHURNAL STRUKTURNOI KHIMII in Russian Vol 26, No 3, May-Jun 85  
(manuscript received 15 Nov 83) pp 43-46

VESELKOV, A. N., DYMANT, L. N. and KULIKOV, E. L., Sevastopol Instruments Construction Institute

[Abstract] Proton NMR (270 MHz) studies were conducted on the aggregation of acridine orange in 0.1 M phosphate buffer, pH 7.0, at 21°C, to determine the effects of concentration on proton chemical shifts. The most pronounced chemical shifts were noted in the case of protons H<sub>4,5</sub>, with the chemical shift of each proton displaced toward a weaker field. On the basis of the chemical shifts the calculated association constant for acridine orange by the NMR method was determined to be 6100 ± 700 M<sup>-1</sup>, a figure approximately an order of magnitude greater than association constants for other molecules in the acridine series (e.g., proflavin). Graph presentation is made of the most probable structure of acridine orange dimers in aqueous solutions, with the planes of the molecules parallel to one another at a distance of 3.4 Å, and antiparallel stacking with an angle of torsion of ca. 36°. Figures 4; references 12: 2 Russian, 10 Western.

[369-12172]

UDC 541.139+535.372

MAGNETIC FIELD EFFECTS ON PHOTOLYSIS RATE OF CARBON DISULFIDE VAPOR

Moscow KHIMICHESKAYA FIZIKA in Russian Vol 4, No 8, Aug 85  
(manuscript received 24 Jul 84) pp 1141-1143

MAKAROV, V. I. and BAZHIN, N. M., Institute of Chemical Kinetics and Combustion, Siberian Department, USSR Academy of Sciences, Novosibirsk

[Abstract] A study was conducted on magnetic field effects on mercury lamp-induced photolysis of CS<sub>2</sub> vapors, which demonstrated that with an increase in the magnetic field intensity the rate of photochemical transformation of CS<sub>2</sub> decreased. When the gas pressure was varied from 2.6 to 90 torr with a constant magnetic field intensity of 6.5 kGauss, there was virtually no change in the rate constant. The magnetic effects were compatible with magnetic quenching of CS<sub>2</sub> vapor fluorescence, indicating that the photolytic process is dependent on the reactivity of the excited <sup>1</sup>A<sub>2</sub> state of the CS<sub>2</sub> molecule. Figures 1; references 23: 5 Russian, 18 Western.

[2-12172]

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